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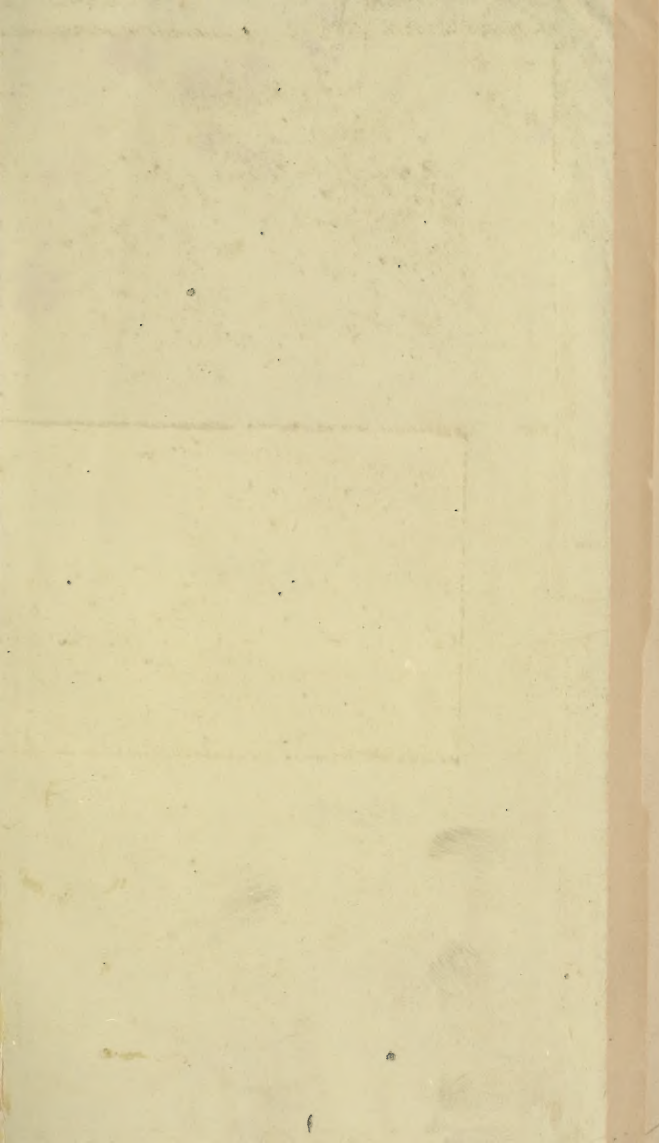
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ODONTALGIA.

ODONTALGIA,
COMMONLY CALLED
TOOTH-ACHE;
ITS CAUSES, PREVENTION, AND CURE.

BY
S. PARSONS SHAW.

Necesse habeo scribere, et dicam ut sentio.

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P R E F A C E.

MY object in the present work has been to offer a treatise which shall be so clear and precise that the physician, the surgeon, and the dentist may alike be able to detect the symptoms of one of the most painful of all maladies, and to correctly estimate the many absurd theories which prevail in regard to the various forms of facial pain.

I have endeavoured also to indicate the methods employed by the intelligent dentist for the prevention of tooth-ache, and incidentally to expose some of the barbarous and harmful practices of quackery.

Furthermore, I have pointed out the means to be adopted with a view to the cure of tooth-ache, so that in cases of necessity, the physician and surgeon may be enabled to effect at least temporary relief in a scientific manner; and when a permanent cure is entrusted to the dentist, how the former class of practitioners—and the more intelligent portion of the public—may enable themselves to obtain some idea as to whether the latter is basing his treatment upon scientific principles, or otherwise.

To have treated the various subjects which legitimately come under the general head or idea of tooth-ache, in a manner that would

leave absolutely no more to be said, would have given the volume greater dimensions than in many respects was desirable. I regarded it as of primary importance that the subjects which were to be most definitely presented, should not be obscured by the introduction of too great a quantity of accessory matter. What Horace recommends to the “gentle craft” in the *Ars Poetica*, I have considered it discreet to observe in a sober treatise on Odontalgia. On the other hand, it was equally important that nothing should be omitted which would assist in the elucidation of those more special subjects; though I cannot but acknowledge that to make at all times a judicious selection, has required, I fear, more ability than I possess.

That in this respect, and indeed in every other, my work will but imperfectly meet the just demands of the profession,—which

are, of course, for a treatise based both upon learning and personal experience,—I am quite conscious.

I have not hesitated to refer, when necessary, to the incompetence of so many of those who practice dentistry. No slight task is imposed on the dentist who strives to emancipate a noble profession from error and charlatanerie, in daily meeting and combating the foolish notions which patients derive from the persons referred to. The course,—disagreeable as it is—which I have felt constrained to adopt, will be appreciated by those who practice dentistry as a science.

I have much pleasure in acknowledging my obligations to my friend, Mr. Samuel Le Resche, for his patience in the application of his artistic skill to the production of the illustrative drawings. These the reader

will perceive to be of the highest usefulness, not regretting that they have added materially to the cost of the volume.

S. P. SHAW.

EXMOUTH PLACE,

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TOOTH-ACHE.

INTRODUCTION.

THE difficulties which prevent the practice of dentistry on scientific principles are alike numerous and embarrassing. The man who addresses himself to this art may have become possessed of such an amount of anatomical and pathological knowledge as involves an acquaintance with the structures of the human body, and with the causes and development of disease:—in addition to this general knowledge he may be especially familiar with the structure of the parts, and with the peculiarities of the diseases,

he is to treat; and of those parts likewise which, from their proximity to the others, are liable to become the seat of pain if not of positive disease when the former enter on a pathetic career. Possessing this knowledge, he will be enabled to correctly diagnose these affections when they appear; and, comprehending the cause of each symptom, be able also to determine the disease it indicates, and to apply the appropriate remedy.

Nevertheless, although he may have these powers at command, he is constantly hindered in the performance of that higher degree of usefulness of which he alone is capable, by the general prevalence of numerous strange, inconsistent, and misleading opinions as to the causes and the character of the diseases he is daily treating. These opinions appear to be authenticated in text-books otherwise possessing high authority; and they are so often repeated, and with such confidence in their correctness, that however well a dentist may understand his profession, and

however well he may know those opinions to be erroneous, the alternative is often presented to him of either retiring in mortified silence, or of risking the appearance of over-confidence in *his own* opinions; and perhaps, also, of impugning the intelligence of those general practitioners whose mistakes have been honestly and conscientiously, though unwittingly, derived from the only sources of information which lie open to them.

Were these opinions confined to patients, they could be met and easily eradicated by sound advice. But the origin of the fallacies in question, and the means through which they prevail, are of such a nature, and they serve so convenient a purpose in hiding or excusing the ignorance or incompetence of the great mass of those persons who, with little or no qualification, have assumed the duties of a profession demanding, in many respects, a very high order of capacity and a great range of acquirements;

that while much progress may be made in the desired direction, it will be impossible to eradicate them entirely until the science of dentistry has become more advanced, and until sufficient intelligence is found among at least the most prominent of its professors, to comprehend that they *are* fallacies, and to combat them. At present, however, such is the general deficiency, not only of the great mass of those who practice dentistry, but of those also who from one cause or another have obtained lucrative practices, that a recent medical writer is constrained to say, "the ignorance, the gross ignorance of many dentists, even of those with a high name, is truly astonishing." So long as this continues, the science of dentistry will make no advance beyond the merely mechanical character which it now possesses in such hands; and the medical profession and the public will continue, with every justification, to expect no medical knowledge in this quarter; nor will they regard as

worthy of more than little, if any, respect, any opinions proceeding therefrom which are contrary to those usually affirmed. Patients, consequently, finding the dentist almost universally a mere artificer, with no higher attainments than the ability to indifferently “stuff” or extract a tooth, or to construct an artificial set of teeth when the natural ones have been lost, will continue to resort to the general practitioner for advice and treatment when suffering from disease in the mouth or contiguous parts; and the physician, whose knowledge of these diseases (unless he has had the clinical experience of a long practice, and has been a close observer), must needs be limited in comparison to what a dentist ought to possess (whether he does so or not), when thus called upon to act, can only resort to his text-book for information and guidance; and, taking for granted (as he is fully justified in doing) that what he finds in standard works is correct, he

is as likely as not, in perfect integrity and great confidence, not infrequently to adopt the most erroneous theories of practice, and to base a treatment thereupon which becomes the most complete empiricism. If these sources of information be searched, it will be almost vain to hope either for an intelligent idea respecting the diseases of the teeth, their causes, progress, symptoms, or effects upon the mouth ;—or for any intimation, that has sufficient force to arrest attention to the fact, that they are the almost invariable cause of certain pains seated in other parts of the face.

That so much error should prevail in medical literature in regard to these diseases, and their effects upon parts of the body distinct from those immediately affected, and also upon the general health, occasions a good deal of surprise when it is remembered what a large amount of information has been given to the profession by writers some of whose names are of the highest

eminence. The statements of Hunter, Fox, Köcker, Deschamps, Harris, Toms, and others are unquestioned ; the importance of their investigations, and their imperative claims to consideration, are undeniable ; and yet, such is the extent to which they are neglected, that Dr. Bond, in his work on "Dental Medicine,"* is constrained to say :—

"That the diseased conditions of the teeth and the structures adjacent to them do exert a most pernicious influence upon the general health, is a fact as well established as any other medical observation ; yet the medical profession seem as yet, with very few exceptions, entirely careless of it. We are not apprised that the subject is ever alluded to by lecturers on the practice of physic when recapitulating to their classes the cause of functional disturbance and constitutional suffering.

* "Dental Medicine as connected with Dental Surgery." By Thos. E. Bond, A.M., M.D. p. 217.

It is not noticed in the many text-books in practice; and certainly, however frequently the physician may look into the mouths of his patients, it is very rarely that his comprehensive glance perceives anything worthy of note in the decaying organs of mastication."

In view of this condition of things, he continues :—

"It is full time that practitioners of medicine should perceive the importance of the teeth and of their diseases; but until they do so, it is the more important that the dentist should be able to point out the causes of obscure disease, which the physician has in vain endeavoured to discover simply because he has sought for it everywhere but in the right place."

While the effects produced by diseased teeth remain unknown to the majority of medical writers, it can occasion no surprise to find their treatises on tooth-ache rendered in a vague and most unsatisfactory manner. Nor need we be

astonished that those writers appear, so far as any definite meaning can be extracted from their circumlocutory style, to be impressed with the idea that this pain is not by any means always caused by a diseased tooth; but that it is often a strange, inexplicable, idiopathic disorder of most uncertain origin.

But we have some right to wonder when we find these same writers pretty accurately describing the symptoms of tooth-ache; and then, instead of recognising the true origin of these symptoms, or entertaining, it would appear, the remotest suspicion of their cause, not only proceeding to assume that they are the manifestations of purely idiopathic nervous diseases, to which they apply the terms "*tic*," "*tic-douleur*," "*prosopalgia*," "*rheumatism in the teeth*," and "*facial neuralgia*" (of which latter there will often be named several varieties, according to its seat, or the peculiarity of its symptoms, or both); but giving the reader to

understand, from the freedom with which these terms are used, that it would be presumption to doubt, and worse than idle to deny, that they are precise, scientific, and, to all intelligent medical men, perfectly intelligible designations of the pains so common to mouth, face, and head.

After thus transposing the proper relations of cause and effect, and substituting the one for the other, it is inevitable that when an attempt is made to elucidate the meaning of these terms, there shall be found in the place of a record of that properly directed observation which leads to clearly established facts and the deductions which are legitimately drawn therefrom, a total want of all clearness of expression. Instead of general principles, we find only crude statements and illogical conclusions based upon observations not extended beyond the first appearance,—which is almost always delusive. From these, in turn, are evolved erroneous

and bewildering theories, which cannot fail to lead the practitioner who may be so unfortunate as to accept them, into absurdities of diagnosis and serious mistakes in treatment ; and if he be a dentist (unless his learning and experience enable him to estimate the correctness of what he reads), not only so, but to disregard the plain and palpable teaching of his own daily observations.

These attempts at description are frequently followed by a statement of the remedy supposed to be applicable to the case, which is usually found to be some powerful general anodyne, such as *quinine*, *morphia*, or *bella-donna*, often in company with a purgative to alter the condition of the stomach.

It is true that these anodynes, by blunting the sensibility of the encephalon, will arrest for a time almost any pain ; but they have no especial bearing upon the affections under consideration ; and very little reflection will convince

the thoughtful therapist that medical science would be in a position bordering upon pauperism if it should really appear that it had only these general palliatives for the relief of some of the most frequent and severe pains to which humanity is liable.

It is proper, however, to observe, and somewhat curious that a recent American writer on Homœopathy (Guernsey, p. 298) names *quinine* in potent doses, from a half to one grain, as one of the *specifics* of the “*similia similibus curantur*” theory of medical treatment for *facial neuralgia*. Whether this may be regarded as the mountain coming to Mahomet or Mahomet going to the mountain, certain it is that the author has found this drug, in this and larger—in short the ordinary—doses, to generally act in a more direct manner on tooth-ache than any other medicine, and in many instances to act directly upon and cure it in a manner most surprising.

It is not to be denied, however, that much as we may deplore this paucity of information respecting diseases of the teeth in medical works of a general character, there is found, on looking deeply into the subject, as usual in

such cases, an extenuating, if not a good and sufficient explanation of the want of it. Let us see in what this consists.

All, or very nearly all, of the real progress that has been made in a knowledge of the affections of the teeth has been founded upon the old system of studying disease; in which the science of pathology was little else than a collection of clinical experiences, the result of long and patient observations upon the living subject, not recorded until the mind had become matured.

Now, however, that the attention of medical men is necessarily so much directed to the disclosures of the microscope, the investigations made with this instrument so engross both writers and readers, that the old system is for the time almost displaced by one which it is well, for the present, to pursue independently of all past methods.

While, however, through the constant and

energetic use of the microscope, we are daily obtaining new facts, facts moreover, which are fitting the practitioners of all branches of medicine, as nothing else could, for extended and more accurate observations in the future, we are for the present not only not getting so much of the old-fashioned clinical experience, but even that which has been recorded is much neglected. When our present keen interest in these new and wonderful developments shall be a little abated, it is to be hoped that we shall have a return to the observations of the old writers, which possess a value at present insufficiently appreciated, and to a more careful record of daily experience; which, qualified and guided by the microscopical discoveries, will ultimately develope a system of medicine that will stand the severest criticisms.

These explanations of what we must regret, suggest no particular fault in procedure, and no blame to persons; but there is another demerit

of which this cannot altogether be said, notwithstanding that very great allowance must be made for the natural desire of the educated dentist to keep up as intimate a relation as possible with the general department of the science of which he is conscious of being a most important member; and we are not to forget that the learning, and even the prejudices of school, for both good and evil, remain with us for life, and consciously or unconsciously sway our minds at all points.

Those dental writers to whom we are most indebted for information, have failed to make the impression their writings deserve, either because they did not possess the independence of thought which would have enabled them to treat, from a thoroughly original point of view, the diseases with which they were so familiar, or because they were unwilling to do so; and they have too often lapsed into a display of erudition, which, incorporated with their own observations

and qualifying them, has unfortunately served to greatly mislead all those not prepared to sift the wheat from the chaff.

Even so eminent a writer as Dr. Chapin Harris—whose work supplies abundant evidence that he could both observe and think, and who was well informed in every branch of his profession—instead of abiding by his own accurate observations, and those of his equally eminent professional brethren, commences his remarks upon tooth-ache by saying, that it is “a symptom of some functional or structural disturbance either of the organ in which the pain is seated, or in some other part or parts of the body, but more frequently of the former than the latter.”* And of the causes of tooth-ache, he says, they “are almost as numerous as the varieties of character which it exhibits. Irritation and inflammation of the pulp, and inflamma-

* “Harris’s Principles and Practice of Dental Surgery.” p. 345.

tion of the investing membrane, are among the most frequent, but it is sometimes referable to a morbid condition of the nerve or nerves going to a single tooth, or of the trunk from which several teeth are supplied; also to derangements of the digestive organs, and to certain diathesis of the general system," and so forth. Further on he quotes Dr. Good, (as if *he* were an authority!) who says of tooth-ache, that "this is often an idiopathic affection dependent upon a peculiar irritability (from a cause we cannot easily trace) of the nerves subservient to the aching tooth, or of the tunics by which it is covered, or of the periosteum or fine membrane which lines the interior of the alveoli. But it is more frequently a disease of sympathy, produced by pregnancy, or chronic rheumatism, or acrimony of the stomach in persons of irritable habits. It is still less to be wondered at that nerves of the teeth should often associate

in the modern pain of facial neuralgia or *tic-douleurux*, as the French writers sometimes term it, for here the connection is both direct and immediate. In consequence of this the patient in most instances regards the teeth themselves as the salient points of pain (as they unquestionably may be in some cases), and rests his only hope of relief upon extraction, but when he applies to the operator he is at a loss to fix upon any particular tooth. Mr. Fox gives a striking example of this in a person from whom he extracted a stump which afforded him little or no relief, in consequence of which his patient applied to him only two days afterwards, and requested the removal of several adjoining teeth which were perfectly sound. This he objected to; and, suspecting the real nature of the disease, he immediately took him to Sir Astley Cooper, who by dividing the affected nerve produced a radical cure in a few days."

By referring to Mr. Fox,* it will be seen that Dr. Good rather overstates the case ; and it will be evident to anyone acquainted with the symptoms of odontitis, that his patient was suffering from that pain ; and that, instead of its being a case of "*tic*," he had simply failed to discover its seat. What Mr. Fox would have us suppose when he says that "Sir Astley Cooper divided the suborbital branch of the fifth pair of nerves," is not readily determined ; but what was really done, any anatomist may pretty easily settle, for he says, "The nerve was completely divided, *as the power of raising that side of the lip ceased, and it remained in a state of paralysis* ;" showing that it was a *motor* nerve, and not a *sensory*, which was severed, and that it was not possible for this to effect a cure. The preface which Mr. Fox makes to his record of this case shows how he was induced to suppose

* "The History and Treatment of Diseases of the Teeth." By Joseph Fox. p. 32.

that "*tic-douleureux*" was an idiopathic disease of the nerves, chiefly affecting the fifth and seventh pairs; but if he had relied upon his own good sense and learning (which, on diseases of the teeth and mouth, and the pains arising therefrom, was altogether more than that possessed either by Sir Astley Cooper or Dr. Houghton); and had he, instead of allowing himself to be misled by the empiricisms of popular authorities, based his diagnosis on the accurate observations he has so very clearly recorded in other sentences, he would not have omitted those proper inquiries and investigations which show the seat of this pain; nor would he have made himself a party to disfiguring his patient by an operation which after all could not have been what it was supposed to be.

Interspersed with such remarks and extracts as have been quoted, Dr. Harris, in other paragraphs, very clearly and carefully indicates the symptoms of tooth-ache. This renders it so

much the more to be regretted that he has not let us see more of the intelligent dental practitioner; making room for such matter by omitting whatever had emanated from those who could not write intelligently upon this subject, and who thought to compensate deficiency of learning by verbosity of style, which, instead of instructing the enquiring student, stands between him and the truth he is seeking. There is abundant evidence that Dr. Harris might have done so had he been disposed.

Greatly, then, as we have a right to lament the errors constantly met with in general medical literature, in respect of matters relating to the diseases of the teeth and the pains induced by them, what blame may be deserved cannot rest with these writers alone. For so long as there is found in the writings of the most eminent dental authors, incorporated with precise and definite teaching, the same vague and unsatisfactory treatment of a subject upon which

the reader expects, from their position, exact statement and positive information, the former class of writers must not be exclusively censured for deficiency in that minuteness of information which the specialist is most certainly bound to afford. That the vague and unsatisfactory should occur in the writings of those who could not possibly have hourly opportunities for observation, such as a dentist must needs possess, is unquestionably a great defect; but how much greater is it when manifested in writers by whom the requisite opportunities for observation had been fully enjoyed!

Again, in microscopical investigations, the teeth have assumed a speciality which in itself has laid the foundation for the practice of dentistry, as a distinct branch of medicine, much deeper than is generally supposed. Yet there is evidently a consciousness of this, and the task of demonstrating these diseases, and of explaining their influence upon the general

system, is now expected of the dentist to a degree more than is expressed. He ought therefore to be able to intelligently comprehend the phenomena daily presented to his observation ; and to thoroughly understand the diseases of the teeth, and those other diseases to which they give rise ; and to be able to think and speak of them with a clearness correspondent to the speciality of his practice, and to his superior opportunities for investigation.

But until more members of the dental profession, than at present is the case, become aware of what is expected from them, and of the position they ought to occupy ; and until they are stimulated by ambition to become qualified for the task they undertake, this branch of medicine must needs languish.

When, however, by the accomplishments of its professors, dentistry assumes its rightful position, we may expect an accumulation of instructive observations from a variety of minds

cultivated in all the branches of this science. These observations will become, from their transparent truthfulness, the recognised authority in relation to the diseases which at present are so little understood, and to the pains which are at present so mysterious; and when this desirable result is attained, the facts which dental science alone can teach, will make their way (to the entire exclusion of the prevailing speculations) into general, as well as special medical literature.

Although the assumption that tooth-ache is ever a disease arising from a variety of causes, (many of them of a strictly constitutional character); or the other assumption, that its symptoms are idiopathic affections of the nerves, could not be defended,—even if nothing more were known of the structure and the diseases of the teeth than what is obvious to any intelligent practitioner who considers the pains they are well known to be capable of producing, and who

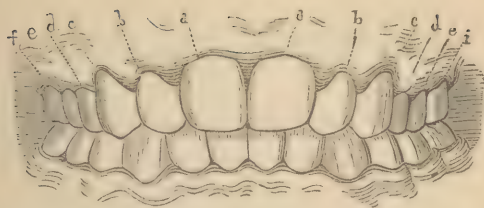
looks into the mouth and sees the destruction of their organisation;—with the light now before us, the proper mode of studying these diseases is first to attain a knowledge of tooth-structure, as disclosed by the microscope, and of the agents which influence and destroy it. In this enquiry we shall find that so far from tooth-ache originating in “*tic*,” “*neuralgia*,” or any idiopathic disease of the nerves, or proceeding from any disorder of the stomach; we shall find, we say, that it is a malady confined to the teeth and their integuments; and that it is the source, almost without exception, of the pains which so much perplex enquirers who persist in looking for their origin in every direction but the right one.

THE TEETH.

THE permanent teeth are thirty-two in number, and are arranged in pairs, and as antagonists. They consist of a pair, to each jaw, of front incisors (*cutters*); of lateral incisors; of cuspids (*spear-heads*); of first bicuspids (*double spear-heads*); of second ditto; of first, or anterior molars (*grinders*); of second or middle ditto; and of posterior molars, generally called the *wisdom-teeth*.

Without further explanation, by reference to Fig. 4, a general idea of the antagonism of the teeth will be obtained; while Fig. 1 gives a front view, with the teeth seen as far back as the first molars.

Fig. 1.



a. a. Front incisors. *b. b.* Lateral ditto. *c. c.* Cuspids. *d. d.* First bicusps. *e. e.* Second ditto. *f. f.* First molars.

As the prime organs of mastication, the teeth are the hardest portions of the human body, and present an organisation, which, although somewhat analogous to bone, is, nevertheless, distinct from it, and peculiar to themselves.

ORGANISATION OF THE TEETH.

A TOOTH consists of three portions: the crown (Fig. 2, *a*), which is all that pre-

Fig. 2.



Front view of
a superior cuspid
(eye) tooth.

- a.* The crown.
- b.* The neck.
- c.* The root.

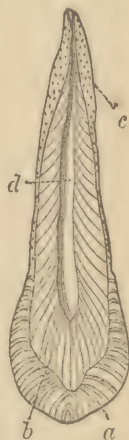
trudes beyond the gums, and is exposed in the mouth; the root, or roots (*c*), the portion surrounded by the socket, and immediately enveloped by the periosteum; and the neck (*b*), or the portion covered only by the gum. It is composed of four distinct structures, called respectively the enamel, the dentine, the cementum, and the pulp.

The *enamel* (Fig. 3, *a*) is that hard and dense covering which extends over the crown,

and protects it from corrosive agents and mechanical injury. The enamel is itself covered with a still finer shield, called the *enamel cuticle*, a calcified structureless membrane, which, from its great power of resisting chemical re-agents, is especially adapted to aid the enamel in preserving the tooth from decay.

The *dentine* (*b*) constitutes the greater portion of the substance of the tooth. It is less dense than the enamel, yet it is far more dense than bone; and is so formed as to present the greatest amount of resistance to force. The dentine is traversed by numerous microscopic tubes, which commence in the wall of the pulp-cavity, and run through its entire

Fig. 3.



Section of a superior cuspid tooth.

- a.* The enamel.
- b.* The dentine.
- c.* The cementum.
- d.* The pulp-cavity.

thickness, penetrating the enamel in the crown, and the cementum in the roots. These tubes are without doubt traversed by nerve-filaments, which give sensation, and probably by vessels, which give vascularity to the tooth.

The *cementum* (*c*) is the external structure of the root, as the enamel is that of the crown. It commences on the neck, where the enamel ceases, as a thin layer, becoming thicker as it descends into the socket, and attaining its greatest dimensions upon the extremities of the roots. In character, the cementum is more like bone than the other hard parts of the tooth; it possesses, also, much greater vascularity. On the inner surface it enters into intimate union with the dentine, no intermediate substance intervening; while the outer surface is covered by the dental periosteum, which is firmly attached to it on the one side, and to the *alveolus*, or tooth-socket, upon the other.

In the body of the dentine is the *pulp-cavity*

(*d*), which commences at the apex of the root, and gradually enlarges until it assumes, in the upper parts of the root, and in the lower part of the crown, dimensions quite important.

The *pulp* is that portion of the tooth so often called the “nerve.” It is an exceedingly sensitive and highly vascular mass, composed of delicately organised capillaries, blood-vessels, and nerves, rising at the apex of the root, and filling the entire pulp-cavity. According to Kölliker,* “from three to ten small arteries pass into the pulp of a single tooth, which, at length, produce both in the interior and upon the surface of the pulp, a somewhat loose network of capillaries, from which the veins arise; at the surface these capillaries here and there present evident loops. The tooth-pulp does not appear to possess any lymphatics, but its nerves are extremely well developed. Arising from the

* “Manual of Human Microscopic Anatomy.” p. 300.

well-known *nervi dentales*, there passes into each fang a trunk, and, together with it, as many as six or even more fine twigs, which ascend into the cavity without, at first, forming any considerable anastomosis, but giving off separate fibrils, and in the thicker part of the pulp form a richer and richer plexus, with elongated meshes and collections of nerve-tubes, and thus gradually break up into fine primitive fibres."

This mass is connected with the dentine by means of the *lining membrane* of the tooth;—a delicate structureless substance which spreads over the entire surface of the pulp-cavity, and thereby completely envelopes the pulp. The lining membrane is also the medium of communication for those nerves of the pulp which pass into the dental tubules. It finally merges, at the apex of the root, into the dental periosteum or investing membrane.

The *dental periosteum* is a white and fibrous membrane, resembling, in general character,

other structures of the same kind, except that it is softer, much more sensitive, and non-elastic. It is quite uniform in thickness; and enveloping the roots of the teeth, is attached to them upon its inner surface by means of small fibrous prolongations and a quantity of vessels which penetrate the cementum; and its outer surface unites in much the same way with the alveolar processes or sockets of the teeth. Hence it becomes the medium of the vital connection of the teeth with the general system; and performs all the other offices required by the indispensable soft structure which must needs exist, in the living organisation, between two such hard bodies. The cementum is therefore a wise provision of nature—indeed an imperative necessity, since it allows of that membranous adhesion which would be impossible were not the outer surface of the roots of the tooth composed of some substance much more porous than the dentine.

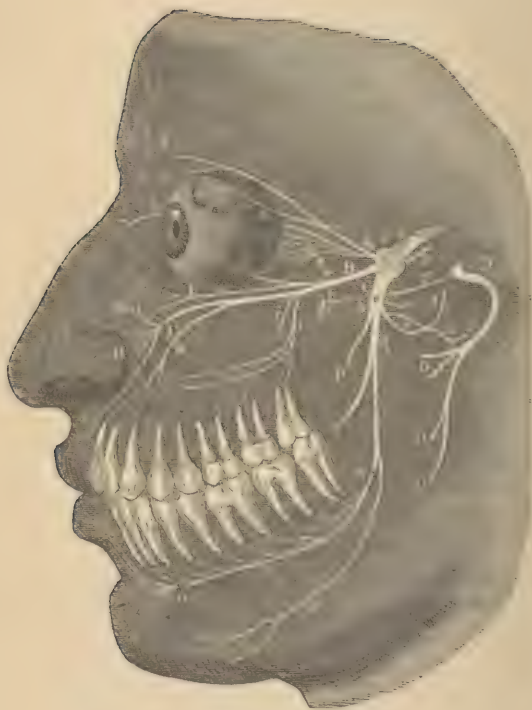
THE TRIFACIAL NERVE.

THE teeth are supplied with sensation from branches of the *fifth pair*, which is the largest of the cranial series of nerves. This is sometimes called the trifacial nerve, and also the *trigeminus*, because while within the cranium it divides into three portions, which are ultimately distributed to the superior, the inferior, and the middle parts of the face.

The TRIFACIAL (Fig. 4) is the sensory nerve of the face, a nerve of the special sense of taste, and also the motor nerve of the muscles of mastication.

It is somewhat analogous to a spinal nerve in its origin by two roots, a *sensory* (1) and a

Fig. 4.



motor (2), by which one of its divisions is a compound nerve.

EXPLANATION OF FIG. 4; SHOWING THE ROOTS, GANGLIA, AND BRANCHES OF THE TRIFACIAL NERVE.

1. Sensory root. 2. Motor root. 3. Gasserian ganglion. 4. Ophthalmic ganglion. 5. Otic ganglion. 6. Spheno-palatine ganglion.

A. OPHTHALMIC division, which is entirely sensory. B. SUPERIOR MAXILLARY division, which is also entirely sensory. C. INFERIOR MAXILLARY division; this receives the motor root, the greater part of which is distributed, by means of (p) the anterior trunk, to the muscles of mastication. D. D. D. Portion of the FACIAL, or motor nerve of the face, and its branches (cut).

Chief trunks of the ophthalmic division.—a. *Lachrymal* nerve. b. *Nasal* nerve. c. *Frontal* nerve. (d. *Supra-orbital foramen*.)

Chief trunks of the superior maxillary division.—e. *Orbital* nerve. f. *Malar*, and g, *Temporal* branches of orbital nerve. h. *Ganglionic* nerves. i. *Posterior dental* nerve. j. *Anterior portion of ditto* (cut). k. *Anterior dental* nerve. (l. *Infra-orbital foramen*, where the superior maxillary nerve emerges from the infra-orbital canal upon the face.) m. *Palpebral* nerve. n. *Nasal* nerve. o. *Labial* nerve.

Chief trunks of the inferior maxillary division.—p. *Anterior trunk*, which receives nearly all of the motor filaments (cut). q. *Posterior trunk*, which is mostly

sensory, and is the continuation of this division. r. *Gustatory* nerve (cut). s. *Auriculo-temporal* nerve. t. *Temporal branches* of auriculo-temporal nerve (cut). u. *Auricular* ditto (cut). v. *Inferior dental* nerve, branches of which ascend to supply the inferior teeth. w. *Mylo-hyoid* nerve. (x. *Dental foramen*, where the inferior dental nerve enters the dental canal in the inferior maxillary bone.) y. *Petrosal branch* of *vidian* nerve. z. Branch from otic ganglion to tensor tympani muscle (cut). (a. *Mental foramen*, where the mental branch of the inferior dental nerve emerges upon the face.)

Besides being distributed to every part of the face, its branches and ganglionic communications extend to portions of the head; and to the external ear, the middle ear or tympanum; and so forth: it also forms frequent anastomosis with the motor nerve of the face—the *FACIAL* nerve, or *portio dura* of the seventh pair—and occasional connections with the other cranial nerves.

Its real origin is deep within the brain; but the superficial origin of the principal or sensory root is in the Gasserian ganglion, while the

smaller and motor root passes beneath this structure, without establishing any connection with it, and joins the inferior maxillary division of the sensory root just outside the cranium.

The *Gasserian* ganglion (3) is lodged in a depression on the inner surface of the temporal bone, near the apex of its petrous portion. It receives filaments also from the carotid plexus of the sympathetic, and gives off minute branches to portions of the encephalon.

Immediately on leaving the *Gasserian* ganglion, the sensory portion of the trifacial nerve breaks up into three principal divisions; the ophthalmic and superior maxillary, which are sensory nerves exclusively, and the inferior maxillary, which receives, as before stated, the filaments of the motor root, and becomes thereby the compound portion of the nerve.

The OPHTHALMIC (A) is the smallest division of the fifth pair, enters the orbit through the sphenoidal fissure, and is subdivided into three

principal nerves; namely, the *lachrymal* (a), which is distributed to the lachrymal gland, the conjunctiva, and the integument of the upper eyelid, where it joins with filaments of the seventh pair; the *nasal* (b), which is more deeply placed than the other branches of the ophthalmic, and after entering the orbit, gives off three branches which go to the ophthalmic ganglion, the ciliary muscle and iris, the orbicular muscle, the integument of the eyelids, the side of the nose, the conjunctiva, caruncula lachrymalis, and lachrymal sac; it then passes through the anterior ethmoidal foramen, into the cavity of the cranium, which it traverses to the nasal slit, where it passes into the nose, terminating in branches which severally supply the neighbouring mucous membrane, the integument of the lips, the mucous membrane near the fore part of the septum, and joins with filaments of the FACIAL nerve; the *frontal* (c), which is again divided into two branches, one

of which escapes from the orbit, and is finally lost in the integument of the forehead, while the other passes through the *supra-orbital foramen* (d), and after giving off filaments to the upper eyelid, ascends to the forehead, terminating in muscular, cutaneous, and pericranial branches, which are severally distributed to the muscles of the forehead, the integument of the cranium as far back as the occiput, and the pericranium over the frontal and parietal bones.

The SUPERIOR MAXILLARY division (B) is also entirely sensory. It commences at the Gasserian ganglion, and passes forward over the greater wing of the sphenoid bone and through the foramen rotunda, where it leaves the cranium, and crosses the spheno-maxillary fossa, in which it gives off three nerves, the orbital, the ganglionic, and the posterior dental. It then passes through the spheno-maxillary fissure to the infra-orbital canal, where it gives off the anterior

dental nerve, and then continues forwards until it emerges through the (l) infra-orbital foramen upon the face, where it is distributed by means of the palpebral, the nasal, and the labial branches.

The *orbital* nerve (c) divides into two main branches, the *malar* (f) and the *temporal* (g); the first of which emerges upon the face and joins with the FACIAL nerve; while the other is eventually distributed in the integument covering the temple and the side of the forehead, communicating with the FACIAL and the temporal branches of the auriculo-temporal nerve.

The *ganglionic* (h) or sphenopalatine nerves descend to the sphenopalatine ganglion. The *posterior dental* nerve instantly breaks into two portions; one of which (i) pierces the tuberosity of the superior maxillary bone, and, after giving off numerous filaments which form, in the wall of this bone above the alveolus, a minute plexus from which filaments are distributed

to the molar and bicuspid teeth and the lining membrane of the antrum or maxillary sinus, is finally lost in the anterior dental nerve. The other portion of the posterior dental nerve (j) supplies the gums and buccinator muscle. The *anterior dental* (k), which is the largest nerve given off from the superior maxillary division, enters a special canal in the anterior face of the maxillary sinus, and unites with the posterior dental nerve, after giving off filaments to the incisor, cuspid, and bicuspid teeth.

The *palpebral* (m), the *nasal* (n), and the *labial* (o), are the facial branches of the superior maxillary division, and are its terminal filaments. The first supplies the orbicularis palpebrarum, the integument and conjunctiva of the lower eyelid; the second supplies the muscles and integument of the side of the nose, joining with the nasal branch of the ophthalmic division; and the third supplies the muscles of the upper

lip, the mucous membrane of the mouth, and the labial glands. They are all joined, immediately beneath the orbit, with filaments of the FACIAL nerve, whereby is formed an intricate plexus,—the infra-orbital.

The INFERIOR MAXILLARY (C) is the largest division of the fifth pair, and the only one which possesses a truly compound character. It consists of two parts, the larger and sensory proceeding from the Gasserian ganglion, and the smaller and motor part, which is the motor root of the fifth pair before mentioned. These, after union, form a single cord and one nerve made up of filaments of motion and filaments of sensation. At the point of junction is the small otic ganglion. Immediately beneath the base of the skull, it divides into two trunks, anterior and posterior. The *anterior* (p) receives nearly the whole of the motor portion, and subdivides into five branches, which supply the muscles of mastication. The *posterior por-*

tion (q) and larger trunk also receives a few filaments from the motor root, and is divided into three branches, the gustatory, the auriculo-temporal, and the inferior dental.

The *gustatory* (r), or lingual nerve, is a special nerve of the sense of taste, deeply placed throughout the whole of its course; and has its terminal filaments distributed to the papillæ and mucous membrane of the tongue. It has also a few branches of distribution supplying the mucous membrane of the mouth, the gums, the sub-lingual gland, &c.

The *auriculo-temporal* nerve (s) distributes branches to the temporal region, the external ear, and parotid gland. This nerve has also branches of *communication* with the facial nerve and the otic ganglion; and the one which joins the FACIAL forms one of the principal branches of communication between this nerve and the fifth pair. Arising by two roots, it passes backwards to the inner

side of the articulation of the lower jaw, and then turns upwards, with the temporal artery, between the external ear and condyle of the jaw, and finally divides into two *temporal branches* (t), the posterior and anterior; the first and smaller of which supplies the *attrahens aurem* muscle, and is distributed to the upper part of the pinna and the neighbouring integument, while the other accompanies the temporal artery to the vertex of the skull, and supplies the integument of the temporal region. There are also two *auricular branches* (u), the superior and inferior; the first supplying the integument covering the tragus and pinna; the second being distributed to the ear below the external meatus, with other filaments twining around the internal maxillary artery, some of which communicate with the *sympathetic*. Two other branches of the auriculo-temporal nerve are distributed to the auditory canal; and the *parotid branches* supply the parotid gland.

The *inferior dental nerve* (v) is the largest of the inferior maxillary division. It passes downwards, giving off the *mylo-hyoid* (w) branch; and at the *dental foramen* (x) enters the dental canal lying beneath the teeth in the inferior maxillary bone, and, passing forwards in this canal, gives off branches to the inferior molar and bicuspid teeth as far as the *mental foramen* (a), where it divides into two terminal branches; one of which continues within the bone to the middle line, and supplies the cuspid and incisor teeth, while the other emerges from the bone at the mental foramen, and divides into numerous branches which are distributed to the lower lip and surrounding parts.

It is not merely in tracing the branches of the trifacial nerve, as they spread out from their roots to the regions where they are finally distributed, that we get a full idea of their intricate ramifications, extensive as these are; for by means of the extension of the ganglionic

structure to this nerve, it is found that its different branches are in more intimate connection with each other; and the whole nerve by means of this wonderful system of inter-communication, is brought into more or less connection with other cranial and spinal nerves.

Besides the Gasserian ganglion, there are connected with the fifth pair of nerves, the ophthalmic, the otic, the sphenopalatine, and the sub-maxillary ganglion; and these form the cephalic portion of the sympathetic.

The exact character and functions of these organisations are not as yet well understood; but that they serve to form a sympathetic connection between those nerves with which they communicate, is obvious; and much interesting speculation might be indulged in as to the action of the ganglia in distributing tooth-ache to various regions; but we really know so little of nerve-action that at best it could not be more than enlightened hypothesis.

Very nearly all that we know for a certainty, is, that by the nerves pain is experienced. They are, however, so extensively ramified as to suggest a rational mode of enquiry as to the origin of the pains we find shooting through the parts which are traversed by the fifth pair and its ganglia, and to point out a more definite diagnosis than to say it is neuralgia.

Regarding, as do most anatomists, the ganglia as so many *small brains* or semi-independent nerve-centres concerned in the accumulation and distribution of nerve-power, the nerves by which they are supplied are properly their *roots*; and the nerves running from them are their *branches of distribution*.

The cranial ganglia have a sensory, a motor, and a sympathetic root.

The (4) *ophthalmic* ganglion is found in the orbit, and derives its sensory root from the nasal nerve (b,) its sympathetic root from the

cavernous plexus, and its motor root from the THIRD nerve. Its branches are distributed to the ciliary muscle and iris.

The (5) *otic* ganglion is found on the inferior maxillary division just after its emergence from the cranium. Its sensory root is from the auriculo-temporal nerve; its motor root from the inferior maxillary nerve; and its sympathetic communication is by a filament from the plexus surrounding the middle meningeal artery. Its branches of distribution are a *filament* (z) to the tensor tympani, and one to the tensor palati muscles.

The (6) *spheno-palatine* is the largest of the cranial ganglia, and derives its sensory root from the ganglionic branches of the superior maxillary nerve; its motor root from the FACIAL, through the *petrosal filament* (y) of the vidian nerve; and its sympathetic root from the carotid plexus. It is divided into numerous branches, which are distributed to the orbital periosteum,

the nose, the hard and soft palates, the tonsil, the pharynx, and so forth.

The *sub-maxillary* ganglion receives its sensory root from the gustatory nerve; its motor root from the FACIAL; and its sympathetic by filaments from the plexus of the *nervi molles*. Its branches are distributed to the duct of the gland and mucous membrane of the floor of the mouth.

DECAY OF THE TEETH.

WHEN all their structures are unaffected, the teeth perform their office without pain or inconvenience; and very considerable progress may be made towards disease before they give any indication of the torturing agony they are capable of affording. But when disease has obtained control of the teeth, we may expect, if we do not always experience, all the pains they are capable of giving.

As the office and general character of these organs are unlike those of other parts of the body, their diseases are peculiar to themselves,

and must be studied as a special branch of medical science. When the pathologist confounds the maladies of the teeth with those found in bones, he is at once astray, and cannot suggest the proper treatment.

The teeth are never attacked, as the bones are, by spontaneous necrosis; and the immense vitality which centres in the pulp seems sufficient to resist all of those general influences to which the bones sometimes succumb. Those theories, accordingly, which refer these diseases to vital action, consequent upon any general disorganisation, do not, since they cannot, suggest the proper remedy.

That even in structures so dense as the enamel and the dentine, the condition of the general system may have some infinitesimal effect, can easily be imagined. But no organic lesion is capable of producing disturbance in any of the structures of the teeth sufficient to result in their destruction; or even in perceptibly

weakening their vital powers; notwithstanding that there are a few cases recorded of the spontaneous disorganisation of the pulp through a general deficiency of vital energy. And that such disturbance ever causes them to present less appreciable resistance to the forces which produce decay, is a proposition which does not accord with the plainest experience of the dental practitioner who is successful in arresting its progress; however plausible, and even indisputable it must often appear to the mere theorist, and to those whose only opportunity of observing the results of the mode of arresting this disease has been confined to the miserable attempts usually met with.

If it be assumed that these attempts are all that can be effected, and that they serve, as far as possible, to arrest the external action; then, in view of their constant failure, it would be proper to attribute the further progress of disease in these organs to an incurable predisposition

having its origin in the weakness or in the entire loss of their vitality. But it is fortunate that ordinary "tooth-stuffing" is not all that can be accomplished in arresting decay in teeth ; and we know that when all the requirements of a filling are met, as in almost all cases they may be, by the properly qualified dentist, he succeeds in arresting decay ; and the success, or the failure, is not to be attributed to any condition absolutely beyond surgical control.

Nor will the proposition of Mr. Tomes,—who undertakes the advocacy of a chemico-vital theory of decay,—namely, that the vitality of the dentine "must have been lost before the tissues undergo decomposition,"* be found to accord any better with the facts which are presented to the dentist. One of these is well stated by Dr. Harris, who says, in referring to the theory in question,

* "A System of Dental Surgery." By John Tomes, F.R.S. p. 321.

“that this opinion is erroneous is proven by the fact, that the animal framework of the affected part, after the complete decomposition of the earthy salts, is often so exceedingly sensitive, that the slightest touch of an instrument is productive of severe pain, thus demonstrating conclusively the existence of remaining vitality.”* To this may be added that if decay were dependent upon the loss of vitality in the dentine, there would be only the very slightest pain, if any, in excavating the tooth preparatory to filling.

The well-known fact stated by Dr. Harris, receives some explanation from Professor Kölliker, who says, “the organic basis of the teeth may be readily obtained by treating them with hydrochloric acid. This *tooth-cartilage*, as it is termed, completely retains the form of the dentine, and, except that the tubes are with

* Op. cit. p. 248.

difficulty visible, even its internal structure. If it be macerated in acid or alkalies until it is quite soft, the matrix is found in the act of disintegration, but *the dentinal tubes, with their walls, are still preserved, and may be isolated in large quantities.* When still longer macerated, everything is dissolved.”*

This would seem to show that even after the complete destruction of its earthy salts, not only may the animal substance of the tooth remain, at least for a time, but that the dentinal tubes, through which vitality is conveyed to the dentine, constitute *the very last part of the tooth to be destroyed.*

It thus appears incontestible that, so far from the decay being dependent on the loss of vitality, nature has made provision, in the tenacious character of the walls of the dentinal tubes, for life to linger even after decay has

* Op. cit. p. 292.

ceased its ravages ; although neither experience nor reason show that it is long able to survive the effects of the fluids which saturate the tooth-cartilage.

Again, if this theory of decay were correct, we should find that a tooth that was *devitalised*, or had had "the nerve destroyed," would decay more rapidly, in the same mouth, than one still possessed of vitality ; and that a tooth possessing great sensitiveness would resist decay. But instead of this, we find a filling quite as successful in arresting decay in a dead tooth as in one not devitalised ; and that so far from sensitive teeth resisting decay, they are as liable to disease as any others ; indeed it sometimes appears as if they were *more* liable.

But although Mr. Tomes insists upon the absence of vitality as a primary stage of disease in the tooth, he says further : "There cannot be any difference of opinion as to the merely chemical character of the processes by which the

enamel and the dentine are softened by the removal of the earthy matter, and ultimately disintegrated."* And his microscopical researches in this direction are most interesting and instructive.

When decay is attempted to be accounted for upon any supposed analogy to caries in bones, it should be remembered, first, that the teeth have an organisation different from these structures; second, that unlike these organs, they are *exposed to external action*; and, third, that in disease they present altogether different painful symptoms.

There is another theory which would not have been noticed but that it is advanced by some recent German writers, and repeated in works which in other respects possess great worth and authority. The theory referred to is thus stated by Kölliker in his work above quoted:† "Caries is not merely a solution of the teeth by the fluids of the mouth, for a putrefactive

* *Op. cit.* p. 318. † p. 310.

decomposition of the organic parts of the tooth, which is *accompanied by the development of infusoria and fungi*, goes on at the same time ; nay, the latter, according to the statements of *Ficinus*, appear to play the chief part in this process, inasmuch as caries proceeds principally from those parts of the tooth where the organisms in question may grow undisturbed, as the fissures and small pits of the enamel, the depressions on the crowns of the molars, and the crevices between the teeth ; but not in other places where the dentine may have been exposed, as upon the masticating surface, on filed parts, etc.” The surprise we feel that a clever writer should have adopted and should assist in the promulgation of this absurdity, is increased when we find him giving, at the same time, such an accurate description of the appearance of decay as shows much patient investigation. He says, “In *caries*, the discoloured enamel-cuticle, which is beset with the growing organisms (an in-

fusorium, similar to *vibrio*, which *Ficinus* calls *denticola*, also *fungi*, *leptothrix buccalis*), first loses its calcareous salts, and then breaks up into angular, cell-like particles, as if it had been treated with hydrochloric acid. The same process then advances through the enamel to the dentine, always softening it first, so that it contains only ten per cent of ashes (*Ficinus*), and then disintegrating it. The dentine suffers more than the enamel; and its tubes become filled with the fluid arising from the decomposition," and so forth. "Subsequently, a brownish matter is deposited in the tubes, and then the intermediate substance breaks down completely. In this manner, the process of destruction advances further and further, until, at length, the crown breaks down, and the fang also loosens and falls out."

So far as these statements profess to assign the cause of decay, they claim nothing beyond an expression of astonishment that such anti-

quoted and absurd notions should find a place in any modern writings. Those which relate to the appearance of decay will be pretty well understood when the true theory is stated.

The true cause of decay may be seen in the composition of the hard structures of the tooth, and of the fluids of the mouth. The hard part of the tooth is made up, to a great extent, of earthy salts; namely, phosphate, fluuate, and carbonate of lime; phosphate of magnesia, soda, and so forth. In the enamel these form from 95 to 98 per cent., and in the dentine 70 to 75 per cent. of the whole. The remainder consists of an organic framework called the *tooth-cartilage*.

When it is known that there may be acids in the mouth of sufficient strength to act upon these salts, the cause of decay is at once suggested; and the undoubted, and now universally acknowledged, process by which the hard structure of the tooth is broken down, is the dissolu-

tion of its earthy salts by means of acids ; the only questions that are raised being those we have already answered.

It was in the year 1821 that the Drs. Parmley, of New York, for the first time distinctly advanced the doctrine that not to vital phenomena at all, but to external corrosive action alone, are we to look for the cause of decay. The idea had been previously suggested in the writings of the French dentists and anatomists, and in England it was not unknown, but this was the period and the manner of its first distinct promulgation. The advancement of this doctrine not only suggested the sole possible mode of arresting this malady ; and furnished a sound reason for the success of the operation of filling the teeth (which had then begun to attract great attention through the labours of Hudson, Harwood, Koecker, Rodgers, the Parmleys, and others) ; but it also gave the hope for that yet higher progress in this art, which, with those

among whom the true doctrine of decay has since prevailed, has been realised to an extent scarcely conceived, by even the best and most sanguine operators of forty years since. And it can occasion no surprise that, with those who have clung to erroneous theories of decay, little or no advance has been made in arresting its progress, beyond the clumsy attempts of the earliest practitioners.

Acids exist in the oral fluids, to some slight extent, in health. Then, however, they are not usually of sufficient strength to act upon the teeth, even when the latter are of a very frail character. But they are liable to be increased, although how this is altogether effected, is uncertain. Dr. Harris thinks it is through the mucous fluids, which become viscid by means of the disturbance of some functional operation of the body; and that, if all of these operations were healthily performed, decay would seldom occur. Be that as it may, that the oral

fluids become viscid in some manner, is easily shown ; and that acids are found in the mouth which are capable of disorganising the teeth, is a fact beyond all doubt.

It is certain, also, that the formation of these acids is often indirectly promoted, if not always caused, by functional operation, as suggested by Dr. Harris. It is equally certain that they are directly formed by the action of the oral fluids upon relics of food lodged between and around the teeth ; upon certain condiments which are taken into the mouth (especially when held there for any length of time) ; upon the tooth-cartilage, after the salts have been removed ; and upon the pus which exudes from the gums when they are inflamed.

Acids capable of destroying the teeth are also introduced into the mouth directly, viz., by certain medicines ; and in various other ways.

The smooth and polished surface of the enamel, and the great density of this structure,

combine to resist any of the agents that bear destructively upon the teeth; and they could be bathed in extremely viscid oral fluids without much fear of harm, if there were not, occasionally, certain places in the enamel which are weak or defective, and at which points the acids prove too powerful. When an opening has been made through the enamel, as the dentine possesses less power of resistance, and the cavity affords greater opportunity for the accumulation of *débris* of food and other substances which promote the formation of acid and thereby increase the destructive force, the disease goes on, with constantly accumulating energy, until the tooth is destroyed.

Decay is more or less rapid according to the strength of the acids on the one hand, and to the constitutional quality of the tooth and its consequent power of resistance, on the other. This constitutional character of the teeth, when they are once formed, will not vary; and their

power of resisting decay will remain, so far as we are able to discover, neither impaired by disease, nor improved by health. On the other hand, the strength and energy of the acids very much alter, depending considerably upon the general health, the cleanliness of the teeth, the healthy or diseased state of all the structures of the mouth, and upon what direct addition is made to them. Decay, accordingly, in the same mouth, or even in the same tooth, may be much greater at one period than another. Sometimes it will be years in destroying a tooth; in other instances a few months will suffice. It is obvious, however, that in youth the teeth decay more rapidly than in after years, when they acquire a greater degree of density.

Even dental authors who maintain the correct theory of decay are apt to lend an indirect and unintended sanction to what is erroneous in the use of the term "caries;" which word, after

all, if applied to no other disease, would be perhaps the most appropriate that could be found; but which, as it is used in all medical writings to designate a disease in the bones in no way akin to dental decay, must have a constant tendency to perplex the mind, leading to confusion of things quite distinct. This is an error which should be especially avoided. How to steer clear of it does not appear to have been suggested; and until medical philologists have settled to which of the two diseases the term is to be applied, it would be well for dentists to avoid it altogether, and to employ only the equivalent word "decay," which is in general use even among medical men.

EXPOSURE OF THE PULP.

WHEN decay is ravaging a tooth, there may be unpleasant sensations, and occasionally a sharp twinge ; and the removal of the disorganised dentine, preparatory to filling, may, as the numerous nerve-filaments traversing the dentinal tubes are severed, sometimes occasion much suffering. But there will be no decided or continuous pain, and the pulp will remain unaffected until the dentine is destroyed down to the wall of the pulp-cavity, and the lining membrane of the tooth is by this means exposed.

When, however, the lining membrane is reached, not only those agents which act upon the dentine, but the pressure of food, hot and

cold liquids, salt, and other substances, begin to irritate this structure ; and then ensues pain of a character much more continuous and intense. This may at once develope into the severest tooth-ache, but this is more likely to be retarded until the enamel is broken down. This structure, being thick and very strong upon the parts of the tooth which receive the force of mastication, will often remain unaffected (except, perhaps, at the small orifice where the decay commenced) for a long time after the dentine beneath it has been destroyed ; when having no longer any support, it gives way, and the *débris* of hard and soft substances is crowded upon the now exposed lining membrane and pulp with such force as seriously to impair the organisation of these delicate structures, whereby agonizing pain of necessity ensues.

While exposure of the pulp is usually caused by decay of the dentine, this result is sometimes induced by other means.

There is an unexplained denuding process which occasionally attacks the teeth, whereby the dentine is gradually wasted away. It is not especially confined to any teeth; nor does it commence, as stated by Harris, with the central incisors or any other particular teeth. The author has also seen the pulp exposed at the apex of the root from the effects of inflammation of the gums and alveolus, and causing severe tooth-ache.

ODONTITIS.

WHEN, in consequence of injury, the pressure of an irritating substance, altered nutrition, or any other cause, any portion of that network of fine vessels known as the capillaries is closed for the time being: or is contracted, or semi-paralysed: the free circulation of the blood, which should find its way through these vessels from the arteries to the veins, is arrested. Thus deprived of its natural outlet, the blood accumulates in the arteries and capillaries, producing in almost every instance more or less heat, or *inflammation*.

This accumulation of blood which should be passing onwards causes great pressure upon the

capillaries and the elastic tunics of the arteries ; and if the situation of the obstruction be favourable, these structures, especially the capillaries, swell, and relieve much of the pressure upon the nerves which ramify through the affected parts. The pain which ensues is consequently much abated. The blood also, which comes rushing along the arteries, turns off into the numerous branches which are unaffected, leaving the diseased portion to be restored to health by the action of the absorbents, by suppuration, and by such other curative processes as nature sets in operation.

But as the pulp is destitute of lymphatics, and is in the greater portion composed of fine blood-vessels and nerves with a very loose and fragile system of capillaries, it is apparently not able to put forth any amount of restorative power when once the circulation through it is decidedly interrupted. The capillaries, moreover, being too weak to resist the pressure of

the arterial engorgement, are speedily broken down; and then the whole of this structure is soon reduced to a state of suppuration.

During this process, as the pulp is confined in a bony cell which prevents any expansion, its vessels, as they become distended with blood, press with such force upon the ramifying nerve-filaments everywhere traversing it as to produce one of the most agonizing pains to which the human subject is exposed.

This is the first form of tooth-ache; and being a pain caused by lesion in the structure of the tooth, it is called *odontitis*.

It occasionally happens, however, that teeth decay and lose the pulp without causing pain.

If we take ordinary medical writings for our guide (particularly the authorities of the symptomologists), we shall be led to believe that tooth-ache presents a wonderful and almost infinite variety of symptoms. A long list might be given of those which unmistakeably point to

odontitis, the most familiar being the pains which are described in the language of common life as boring, tearing, shooting, bounding, digging, thumping, jumping, throbbing, drawing, and so on. But when we enquire into the meaning of these terms, we find that they are simply the various modes of expression adopted by different sufferers to emphasize the great severity of the pain, and to indicate its peculiarity.

This peculiarity is derived from the inability of the pulp to expand, whereby the pain is found exactly to harmonise with the pulsion of the blood into this structure, and there is a steady and regular *repetition* of the severer pang at the moment when the vessels of the pulp are the fullest, and the pressure is greatest on the nerve-fibres. If the decay has exposed the pulp for a considerable distance, and it can at all expand, just so far as it does expand, the pain loses its peculiar characteristic and becomes more like any other.

In precisely the same manner that these terms have originated with ourselves have French writers applied "*tic-douloureux*" to the symptoms of odontitis; although under the impression that they are the indications of a purely nervous affection. And this term has thereby got transplanted into our own language, where it has acquired a range of application that is quite absurd.

The etymology of the word *tic*, as used by the French, is rather obscure, although it is not difficult to imagine how it became applied to a *rhythmical* movement. Nor is it important that the etymology should be determined. It is sufficient for our purpose to find that the word is now regarded in all its applications, save to facial pains, as half slang; and has especial reference, under all circumstances, to a *repeated* movement, as applied in English to the swinging of a pendulum.

In colloquial French its particular use is to

characterise the habit which some horses have of throwing up their heads and snorting, as this movement recurs with a good deal of regularity.

Starting, as it appears from all that can be gathered, from this as its primary signification, the word is often extended in a half jocular and a half depreciating manner to any absurd *habit*, because of its regular repetition, for the purpose of ridiculing or condemning it; such as biting the nails; repeating a certain word; unusual winking of the eyes, or of one eye; twitching the face; throwing the hand about in a certain manner, &c.

When the character of odontitis is understood, and the meaning of *tie* is ascertained, it is not difficult to imagine how some French stable-boy, when his tooth was aching from an inflamed pulp, and he was goaded into the use of some word expressive of its character, naturally adopted a *horsey* phrase from his limited

vocabulary, which idiomatically expressed that he had an excruciating pain "*that had the tic*," or, which *repeated itself at regular intervals*. Nor is it surprising that those who understood the peculiar significance of the phrase, and had also experienced the extreme poverty of all such words as *convulsif* and so forth to express the pain, should have recognised this keen and truthful portraiture of it; and, notwithstanding its origin, have adopted the term into medical literature. If the origin of the pain so well described had been at the same time ascertained, the application of *tic* would have resulted in throwing light upon the character of tooth-ache. Failing to do that, an erroneous conclusion was adopted which has had just the contrary effect.

As odontitis is occasioned in the manner described, this pain is apt to come all at once, and with such severity that the agony seems to shoot through every part of the face. When

it has assumed a more settled character, the pulsation of the blood will promote the throbbing sensation. The pain from an inflamed pulp will continue for a longer or shorter period, when it will cease, to be renewed after an uncertain interval. It sometimes assumes a regularly intermittent character, especially when the patient is weak, or is suffering from any febrile affection that has a tendency to periodicity.

There is much of nature's mercy in this arrangement. Otherwise, the steady continuance of the pain until the pulp was entirely destroyed, would, in many instances, seriously, if not fatally, exhaust the patient.

It is to be noticed, however, that there is usually but one very severe paroxysm of pain in the same tooth, and the paroxysms which follow are much less severe.

As a rule, the pain will be confined to the aching tooth, or only in its wildest paroxysm will it be felt extending to other parts of the mouth. And the firmer the structure of the

diseased teeth, and the less disease there is in the other teeth, and the better, too, the general health of the patient, the more local and severe will be the pain.

On the other hand, in a poorly organised tooth, and in a mouth full of diseased teeth, or where the general health is indifferent, the pain is more diffused and less agonizing, though it generally lasts longer. In a patient of low vital powers there seems to be a less amount of vitality in the teeth to act and to be acted upon; while in dentine of an inferior quality decay spreads over a greater surface as it proceeds. Hence, when the pulp is reached, instead of there being only a very small point over the lining membrane where the dentine is decayed, as in a tooth of denser structure, the side of the pulp-cavity may be softened for some distance before the pulp is inflamed. In this case there may be some opportunity for its expansion, whereby partial relief is afforded.

Sometimes the pain shoots through the mouth and face, causing involuntary twitchings, and is finally lost in some remote part; but this symptom must be largely attributed to the imagination of the patient, who is very apt to think, because of the decided pulsation, that there really is a movement, though none whatever takes place.

While it is true that odontitis may sometimes slightly affect the motor nerve of the face, this symptom is by no means as frequent as we might be led to expect from the constant inosculation of the terminal filaments of this nerve with those of the trifacial. Did this really establish intercommunication of nerve force, as would at first be supposed, we should find that painful twitchings and other involuntary motions in different parts of the face, and more especially in the numerous plexuses formed by the combined interwoven filaments of the two nerves, were almost invariably a marked symptom of odontitis. But so far from this being the case, the involuntary spasmodic symptom is, as we say, rarely noticed; and when it does occur, and we cannot trace it to the imagination, we must look to some cause as yet unknown for its solution.

Owing in part to the error that formerly prevailed as to the character of the facial nerve, when it was supposed

to preside over the sensibility of the face, and was consequently thought to be the seat of *tic-douloureux* ; and in part, perhaps, to premature conclusions as to the effect on the nerves of the anastomosis referred to, we are constantly finding in writings on "*facial neuralgia*," and so forth, the impression that "*tic*" has reference to some combined action of the motor and sensitive nerves of the face. We have already given the origin and exact limit of this term, and it will still further help to dissipate the cloud of errors which has over-shadowed the subject of facial pains, to add some remarks of Todd and Bowman* on the sympathetic action of one set of nerves on another. They say,—

"We learn from anatomical investigation, that, although nerves anastomose with each other in their distribution, this anastomosis is by no means of that kind which would justify the supposition that an irritation could be communicated from one to the other in their course. The nerve-fibres only lie in juxtaposition, *but do not communicate*; and there is an evident provision in the tubular membrane and white substance of Schwann for the insulation of the central axis, which is probably the effective substance in the nervous action. We must seek, therefore, *in the nerve centres* for such a communication between these nerves as may explain the excitability of one by the other.

* "The Physiological Anatomy and Physiology of Man." By Robert Bently Todd, M.D., and William Bowman, F.R.S. Vol. I., p. 391.

In the present state of our knowledge we can do no more than state it as in the highest degree probable that nerves implanted in the centre immediately contiguous to each other can exert an influence upon the vesicular matter of the centre, and upon each other.

But there are certain facts which demonstrate beyond all doubt, that, in such actions as we refer to, the integrity of the centre forms a *necessary* condition. First, in many of the instances, it is plain that there can be no connexion between the affected nerves elsewhere than in the centre, for they are so distinct from each other that there is not even that apparent connexion which results from the anastomosis of a fasciculus of fibres of the one with a portion of the other. Secondly, the removal of the portion of the nervous centre with which any one of the nerves concerned in the sympathetic action is connected, will prevent the development of the phenomenon, although the nerves themselves remain uninjured in their peripheral distribution, or in their connexion with each other. Thirdly, if there were any peripheral communication between nerves, it would be most likely to take place in the plexuses. Experiments, however, upon the nerves which lead to these show that each nerve-tube, in its passage through them, retains its isolation as distinctly as in any other part of its course.

In applying these principles to the explanation of the instances which we have quoted, we shall find it difficult to determine the central connection in some, although in others such a connexion is highly probable. *It remains, therefore, for future anatomical research to ascertain what*

that connexion is which enables one nerve to sympathise with another."

And yet further, Beal's and other experiments seem to unmistakeably show that, in reality, there are *no nerve ends*; and that,—as stated by Dr. R. K. Brown, of New York, in a paper on "The ultimate distribution of the nerves of gustation,"*—"They demonstrate that no part of the sensitive structure of mammalian animals forms organs of special sense by a *terminal* arrangement. *They show that the nervous tissue is an undivided continuation from centre to periphery and back.* And finally, they force upon us the conclusion, adverse to all our present theories of sensation, that neither sensation nor motion are physiological phenomena, beginning at a nerve terminus on the one hand and ending at a nerve terminus on the other."

Again, the pain concentrates in some other tooth, generally a diseased one, and is felt in it exclusively, with no painful indication of the actual origin. Patients suffering from odontitis also very frequently complain of pains in the head, the neck, and even in the extremities; such pains being sometimes accompanied, too, by numbness.

* Dental Cosmos. Vol. viii. p. 585.

When the pulps of two or more teeth are exposed and inflamed at the same time, the pain is almost invariably felt in only one tooth. And sometimes, when a single pulp is inflamed, the pain may be experienced wholly in a tooth that is decayed, but not to the lining membrane. Less frequently, but often enough to occasion no surprise, pain arising from a diseased tooth is felt in one that is perfectly sound.

PERIODONTITIS.

ALTHOUGH a very skilful dentist may occasionally prevent irritation of the pulp even after decay has reached the lining membrane, yet that delicate structure being once inflamed, while it may give more or less pain and may be a longer or shorter time in becoming entirely destroyed, its death is so certain to follow inflammation that the exceptions are not worth consideration. As the vitality of the dentine and of the enamel is wholly derived from the pulp, the disorganisation of this structure is equivalent to the entire devitalisation of the others. And when this takes place, whatever may be the cause, in common parlance

the condition of the tooth is described as "dead," or it is said that "the nerve has been destroyed."

It is a common impression that when a tooth has reached this state, it will not again ache. In a strictly literal sense this is nearly true, and the pains which follow are only occasioned by it. But tooth-ache, properly so called, includes all pains either in the teeth, or occasioned by the teeth.

The prevalence of this opinion is quite as much due to the ignorance of dentists as to the very natural misconception of patients ; since it is by no means uncommon to find the former destroying the vitality of a tooth, and after "stuffing" it, assuring the patient that never again will there be pain felt in it. When the disturbance which is inevitable comes to pass, being unable to divine the cause, this operator falls back upon the unfathomable statement that it is "tic," or something of that kind ; and it is vexing to find this mistake by no means confined to those practitioners whom the public regard as inferior.

When the pulp is disorganised it is resolved into pus, and in that form it is discharged into the cavity in the tooth, where it becomes

mingled with the fluids of the mouth and other accumulations. The dentinal tubes also, no longer supplied with healthy nutriment from the pulp, become saturated with the combined fluids and pus; and the tooth, instead of its previous brilliant life-like aspect, presents a dull, dead, and sometimes quite dark appearance.

The inflammation of the pulp will not extend, to an appreciable degree, beyond this structure; and for just so long as it retains any vitality, it is the pulp alone which is affected; and the tooth, through the unimpaired periosteum, will continue to maintain a healthy action in the cementum, and a firm and painless adhesion to the sockets. But when the pulp has become disorganised, the purulent matter that has thereby accumulated in the pulp-cavity will cause inflammation of the vessels of the cementum, which finally extends to the periosteum, or investing membrane of the tooth, and a dull, uneasy sensation begins to be experienced. At

first this sensation is rather undefined, and of a more continuous character than odontitis, but eventually it is developed into a pain which may not be less severe. The inflammation caused by the purulent matter is much the greatest at the apex of the root where this accumulation comes into direct contact with the cementum; but it is by no means insignificant throughout the whole of this structure, as the matter also reaches it through the dentinal tubes.

As the periosteum lies between two hard structures, it has little power of expansion, though more than is possessed by the pulp. Hence there is the same pressure upon its nerve-filaments; and although this may not produce so *sharp* and acute a pain as that which accompanies inflammation of the soft structures of the tooth, there ensues a pain as difficult to be endured. This is the second form of tooth-ache; and being an inflammation around the tooth, is called *periodontitis*.

If the pains occasioned by inflammation in the pulp (or “an exposed nerve”) are often extended to other parts, their sympathetic action is trifling when compared with periodontitis.

It is seldom that this pain is entirely confined to the place of its origin ; and it frequently extends not only to other parts of the mouth and to the cheeks, but to the eyes, the forehead, the nose, the temporal regions, the ear, and even to the neck, back, and arms. Indeed, its force is sometimes expended in so emphatic a manner in more remote parts, as entirely to prevent suspicion, on the part of anyone not familiar with its eccentricities, that it is tooth-ache at all.

As the irritation of the periosteum extends, the vessels of this membrane become engorged, and it somewhat thickens ; whereby the tooth is slightly raised out of its socket. Hence, when the teeth are closed, the affected one is the first to receive the pressure, and the pain is in consequence increased.

ALVEOLAR ABSCESS.

WHEN inflammation in the periosteum has continued so long that any portion of the especially affected part of this structure has lost its organisation, so much of it is resolved into pus, which is deposited around the apex of the root of the tooth : and such is the irritating character of this secretion, that the inflammation already existing, is so greatly increased that the pain becomes still more aggravated. When the pus has accumulated in the socket, the inflammation has developed an *alveolar abscess*.

Fig. 5.



Inferior molar
tooth, with ab-
scess on its pos-
terior root.

The progress of this disease is much as follows. Beginning at the apex of the root, the periosteum gradually becomes detached from the cementum and forms a sort of sac, in which the pus accumulates and surrounds the point of the affected root. This effusion, which is not only increasing but requires a greater space than the structure it displaces, is consequently pressing upon the walls of the socket with such force that the pain becomes deep-seated and steady, and often most excruciating; and, instead of being confined to the aching tooth, may be extended, and in the most erratic manner, as before mentioned. Meanwhile, by the inflammation in the socket and the cementum, the organisation of these structures also begins to be lost, and more pus is thereby secreted.

This process goes on, and the abscess increases in extent, until, at last, by the combined vital action of the inflammation and the chemical action of the pus, the wall of the socket is so far destroyed that an opening is made in it. Through this opening the pus is discharged, and usually against the soft structures by which the socket is invested; these structures swell in consequence, and the pain is thereby speedily reduced, if not altogether removed.

Sometimes the inflammation is so very considerable that swelling in the gums and other parts takes place before the opening into the socket is formed. Sometimes also (owing, in all likelihood, to the extreme thinness of the socket over the affected part), an opening is made which is preceded by little or no pain. Occasionally the pus escapes by the side of the tooth, and at the edges of the gums. When this happens, it is generally owing to the tooth having no antagonist, whereby it can be raised

in the socket by the swelling of the periosteum, to a greater extent than is usual. Sometimes, on the other hand, it is the result of the use of a sialagogue for the relief of the pain caused by the abscess, or of previous mercurial salivation.

During the rage for mercurial medicines, happily now past, this last-mentioned phenomenon was much more frequent than now.

When the pus comes in contact with the soft parts, it rapidly forms a passage through these structures, whereby whatever portion is not taken up in the meantime by the absorbents is discharged, usually into the mouth, forming what is called a *gum-boil*.

But the discharge of the pus will not always be through the gum, or into the mouth. It may work an opening through the cheek, or the base of the lower jaw, forming a discharging fistula upon the face. It may also discharge into the *maxillary sinus*, causing inflammation of the lining membrane of this cavity.

The swellings developed by an alveolar abscess may not only affect the whole side of the face, but extend beyond the mouth to the tonsils, and the muscles of the neck; and even beyond these last-named structures.

When inflammation has commenced in and about the roots of a tooth, in addition to decay, a new force begins to hasten its destruction. Indeed, it may be said that inflammation in the periosteum and alveolus is the orderly effort of nature to expel a substance which, whatever may have been its previous relation to the rest of the economy, is now, by the extinction of its vitality, only to be regarded as a foreign body. And this process goes on with more or less inflammation and pain, until all these irritants are expelled from the mouth. But after one severe attack of periodontitis, there is not likely to be a recurrence of it equally severe; for although on the subsidence of the inflammation, the gum-boil may entirely close, the orifice in the socket

remains; and when pus again secretes, it finds a more ready exit, by means of the old channel, than before that channel was formed.

SYMPATHETIC TOOTH-ACHE.

NOTHING more misleads the practitioner, unless he be a dentist who is exceedingly well informed, than the disposition of tooth-ache to be felt in other parts than its actual seat. For it will be found so eccentric that the opinion of the patient as to which tooth is the real offender, or whether it is a tooth at all that is in fault, will be quite as likely to vitiate as to assist the diagnosis. Often, too, he will declare, and with perfect sincerity of belief, that the pain is wholly felt in the very opposite part of the mouth to that in which the disease is situated; and not infrequently he is quite positive that it cannot be tooth-ache, as the

pain is not felt, in any degree, in the teeth themselves.

The means by which the pains of odontitis are transferred to other parts, and by which other kindred sympathetic nervous action is produced, constitute one of those mysteries which have not yet been fathomed. Nor will it, nor indeed can it be fathomed so long as merely sympathetic pains are treated as indications of idiopathic disorders.

Instead of looking to tooth-ache for an explanation of the origin of facial pains, we find enquiry taking a wrong direction at the very outset; and, without any such justification as the scientific mind has a right to plead, the facts upon which all conclusions must rest, are quite perverted in the assumption, not only that these pains are, at most, only occasionally the result of tooth-ache, but that they quite as often hold to it the relation of cause to effect.

In thus blinding the eyes to the true cause

of facial pains, and, still worse, in directing the student to look to them for the frequent origin of affections of which they are, almost without exception, in reality the symptoms, enquiry is at once committed to a phantom ship of the imagination, to sail for ever through never-ending nothingness, fruitlessly searching for that which does not exist. It is not surprising, therefore, that the mind seeks relief, although it may be in vain, in the pernicious conclusion that they are the indications of a purely nervous disorder, of which no more is known than the pains which they occasion.

We shall not be far wrong in looking to the action of the ganglionic structure of the sensitive nerve of the face, for the exhibition of tooth-pains in other parts than those of their origin.

What seems to justify this is the frequent extension of tooth-ache in the line of the arteries; and the *character* of odontitis so well described by all the popular terms in use; and also in

the French stable slang, "tic," which we have borrowed from that language; all of which terms signify a *rhythmical* pain of great severity.

There is no sensation that presents more of all the peculiarities of *pain* than odontitis; and in studying the character of pain, this malady affords the best field for investigation. Sharp and intense, the inflammation of the pulp never extending, it would seem, into the adjacent structures, its peculiar features are distinctly presented. Much of the vagueness found in treatises on pain is attributable to mistakes as to the character of odontitis, being made the groundwork of an elaborate system of error, which vitiates all that is thought or said on the subject of pain, and especially of *sympathetic pain*.

Some reference to the anatomy and functions of the so-called sympathetic nerve may aid in suggesting an elucidation of the phenomenon we have noticed.

The sympathetic nerve* "consists of a series of ganglia, connected together by intervening chords extending from each side of the vertebral

* "Anatomy, Descriptive and Surgical." By Henry Gray, F.R.S. p. 564.

column from the base of the skull to coccyx. It may, moreover, be traced up into the head, where the ganglia (which are all in connection with the fifth cranial nerve) occupy spaces between the cranial and facial bones.

Each ganglion may be regarded as a distinct centre, from or to which branches pass in various directions. These branches may be thus arranged:—1. Branches of communication between the ganglia. 2. Branches of communication with the cerebral or spinal nerves. 3. Primary branches passing to be distributed to the arteries in the vicinity of the ganglia, and to the viscera, or proceeding to other ganglia placed in the thorax, abdomen, or pelvis.

The primary branches of distribution have a remarkable tendency to form intricate plexuses, which encircle the blood-vessels, and are conducted by them to the viscera. The greater number of these branches pass to a series of visceral ganglia: these are ganglionic masses, of

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variable size, situated in the large cavities of the trunk, the thorax, and abdomen; and are connected with the roots of the great arteries of the viscera. From these visceral ganglia numerous plexuses of nerves are derived, which entwine round the blood-vessels, and are conducted by them to the viscera."

A further and more especial description of the sympathetic nerve, other than has been given in connection with the description of the trifacial, of such parts of it as are found in the head, is not necessary; and we pass on to Messrs. Todd and Bowman's remarks on its *functions*; quoting only such portions of their able article as seem to bear on the enquiry we are now pursuing.

They say,* "Two questions are to be solved in reference to the sympathetic. 1. Is the sympathetic a distinct and independent portion of

* Op. cit. Vol. ii., p. 141.

the nervous system? or is it merely an off-shoot from the brain and spinal cord, exhibiting certain peculiarities of arrangement? 2. Do its fibres exhibit the same power as those of cerebro-spinal nerves? that is, are they sensitive and motor?" In reply to the first question, they arrive at the conclusion that this is a compound nerve, and continue: "Adopting this view of the compound nature of the sympathetic, it is obviously impossible to regard it either as independent of the cerebro-spinal centres, or wholly depending on them. And it may be stated that the views of anatomy which we hold to be correct, justify us in affirming that the sympathetic exhibits marked indications if not of independence, yet of great peculiarity, in its mode of distribution. Clinging to the coats of the arteries, it follows them for the most part in their ramifications, and attaches itself to them somewhat as ivy does to a tree. The proper mode, then, of stating the reply to this question

seems to us to be: that the sympathetic, taken as a whole, is not in itself a special and independent nervous system, but a portion of the nervous system peculiar in its composition, having, as regards some of its constituent fibres, a special relation to blood-vessels, particularly arteries, (and these are the fibres which are independent of the cerebro-spinal centres, having distinct centres of their own), but being by others of its fibres connected, as all other nerves are, with the cerebro-spinal centres."

In answer to the second question, they conclude that the sympathetic must have both motor and sensitive fibres, although the latter are not very numerous; and that the motor fibres are at most to a very trifling extent under the influence of the will. They then proceed to notice the very striking peculiarity of this nerve, which "consists in the *rhythmical* nature of the movements of parts which derive their supply of nerves from this source, of which

the movements of the heart and the intestinal canal afford good examples. This peculiarity seems to be referable to a double cause ; first, the disposition of the muscular fibres themselves, which is such that a contraction cannot take place at one part without affecting the adjacent fibres, so that the contraction of one set of fibres appears to stimulate those in their immediate vicinity. This progressive contraction is well seen in the intestines. Secondly, the frequent occurrence of small ganglia, not only among plexuses of the sympathetic, but also, as in the heart, upon or among the muscular fibres themselves. These ganglia, it is reasonable to suppose, are so many little magazines of nervous force, which, by their intimate connection with the muscular fibres themselves, render them capable of repeating their action at intervals, after their disconnection from the main trunk of the sympathetic system. Much, however, in the peristaltic actions is perhaps due to the

peculiar constitution of the unstriped muscular fibre itself; a constitution which gives it a slow and enduring, rather than a quick, energetic, and fleeting contraction."

They conclude thus: "The sympathetic thus appears to exercise a three-fold office: first, that of a sensitive nerve to the parts to which it is distributed; secondly, that of a motor nerve for certain muscular parts; and, thirdly, that of a nerve to the blood-vessels. It is almost certain that blood-vessels enjoy in their coats a power of contractility; and it seems highly probable that these nerve-fibres exercise an influence upon that contractility."

These writers object to the term *sympathetic*, because, say they, "Our improved knowledge of the anatomical distribution of the nerves, and of their physiological anatomy, and of their endowments, clearly shows that the phenomena of sympathy are explicable, by the known laws of action of the great nervous

centres, and that the sympathetic nerve can take no more part in it than any other nerve."

That improved anatomical knowledge has dissipated the undefined idea of sympathetic action which referred everything to *sympathy*, is alike undoubted and gratifying; and immense progress has indeed been made in knowledge of nerve organisation. Yet, with all deference to such high authority, it must be stated that no facts or theories have been presented which account for the sympathetic action of tooth-ache. Nor can the proposition, that the known laws of action of the great nerve-centres show that the sympathetic nerve is no more concerned in sympathetic action than any other nerve, be readily accepted. The connection of the ganglia one with another forming thereby a series, at once suggests a sympathetic union not found in nerves that simply spread out into branches and terminal filaments, which, whatever becomes of them, certainly do not communicate with each

other. Without attempting to suggest any theory of sympathetic nerve-action, even in the face, we will point out a few facts and offer a few suggestions.

1. This phenomenon cannot be accounted for by any communication of the nerves at their peripheral filaments, or by any direct communication between one nerve-filament and another by means of the sympathetic ; for no such communication appears to take place ; nor have we a right to imply by the name we give the ganglionic series that such a communication is the cause of the sympathetic action of pain. Nevertheless, this nerve may be, and in all probability is the cause of sympathetic pain.

2. The so-called sympathetic nerve is distributed to the heart and the arteries, and where ganglia are found their branches supply these latter structures. Kolliker says,* that

* *Op. cit.* p. 485.

many arteries are completely destitute of nerves, which may account for any peculiarity observable in the vicinity of those which are so possessed. Referring back to the description of tooth-ache we are reminded, by every popular phrase used to express this pain, of its *pulsating* character. Perhaps this is fully accounted for by the heart's *systole* and *diastole* (which are certainly perceived in the pulp when inflamed); and we cannot fasten upon the sympathetic any certain connection with tooth-ache; yet the intimate relation of this nerve to the blood-vessels, and the *rhythmical* character of its action suggest, when we find *precisely the same peculiarity in odontitis*, as highly probable, that it must have some more direct effect upon this pain than through the heart's action.

3. We have seen that the pressure of the engorged arteries upon nerves ramifying through the pulp causes the pain of odontitis; and if “at

whatever point a sentient nerve be stimulated, a sensation will be produced, which will be referred to those parts, *and to those only*, to which the fibres irritated are distributed,"* the pain caused by this pressure must, so far as the direct branches of the trifacial nerve are concerned, be confined to the tooth. But, how far back does the influence of this engorgement extend? It is not communicated to the periosteum, yet it is hardly probable that the effects of so severe an inflammation can be wholly confined to the pulp. If it extends beyond the pulp it must be communicated to the coats of the arteries, and, so far as these have in them the terminal filaments of sensitive nerves, the pain may be experienced. But, from what we know of nerve force, it would be difficult to trace the effects of the inflammation of the pulp direct to the facial ganglia without sup-

* Todd and Bowman. Vol. i., p. 231.

posing an arterial engorgement beyond anything we have a right to assume. If it can be shown, however (as the arteries are entwined *as the tree by the ivy* by filaments from the ganglia), that these filaments transmit pain to the ganglia, we have only to imagine the disturbance to extend but slightly beyond the tooth to account for the sympathetic action of tooth-ache.

4. The greater number of the fibres of the sympathetic are *motor*, and these we find concerned in *repeating* the peristaltic movements. It certainly has some sensitive fibres, and probably there are a goodly number proceeding from the facial ganglia. It would be in strict analogy with the action of the *motor* fibres to say, that when irritated, the office of the *sensitive* fibres is to communicate the sensation to these *little brains* or *nerve-centres*, whereby it is by them progressively repeated.

5. Sympathetic pain will sometimes be accompanied by tenderness in the parts where the

pain is seated. This fact does not harmonise with the prevalent ideas of sympathetic action.

6. At no point is sympathetic tooth-ache more frequently found seated, than near where the posterior branches of the trifacial nerve and the facial ganglia send off filaments that entwine around, or proceed in company with, the great trunks of the ascending arteries and their branches. From this vicinity a pulsating pain often extends in the line of the arteries upwards upon the temple, and posteriorly in and around the ear.

7. Certain affections of the stomach, cause pulsating head-ache: and, lastly, a severe case of *ranula* produced a very decided pain in an inferior tooth.

Many other pertinent facts could be given; but, after all, neither in dental nor in general practice is it necessary that we should obtain knowledge *how* sympathetic pain originates. The great fact which we have to learn is

this—that tooth-ache very frequently *is* sympathetic, and thereby the cause of almost every facial pain. When this truth becomes recognised, the reduction of all these pains may be easily and effectually accomplished.

DIAGNOSIS OF TOOTH-ACHE.

WHEN a patient is suffering from tooth-ache which has led to other disorders, it is not uncommon to attribute the pain in the mouth and face to these disorders; and to regard the facial pains as an exhibition of what is supposed to be purely sympathetic nervous action. So far from attributing tooth-ache to constitutional disorders, the physician will always act wisely, when there is pain in the teeth or face, in regarding it, not as the effect, but as a powerful aggravator, if not the sole cause, of these disorders.

The effects of tooth-ache, besides those before-mentioned, are general febrile symptoms,

constipation, and a general prostration of the system. The exhaustion alone caused by so severe a pain, especially when accompanied by loss of sleep, will often be so great as to require many days and even weeks to be repaired.

Nature works out her laws with such wonderful wisdom and precision ; and, so far as we have been able to apprehend them, with such an unmistakeable intention to reduce as much as possible the evils resulting from derangements in the animal economy ; that when we find certain conditions invariably accompanying any particular derangement, it must be apparent to all reflecting minds, that they are the least of the evils, and, under the circumstances, the very best for the patient. Without going out of the range of the subject under consideration, or entering upon any general proposition not pertinent to it, but confining the enquiry strictly within the limits of dental science, it is proper to suggest that the effects of tooth-ache should not always be looked upon as so many positive evils demanding eradication ; but as the natural attendants, for some wise and merciful end, upon other diseases : and that, instead of administering curatives which are intended to arrest only these attendant symptoms, the attention of the medical adviser, whether he be physician or dentist, should be primarily directed, either to the eradication of the predisposing local causes

as soon as possible, or to the assistance of nature in carrying out her processes. This being done, the pains, inflammation, swelling, fever, constipation, and other attendant evils, will subside, as they arose, in a natural and orderly manner.

While tooth-ache produces many derangements of the general system, such derangements do not, in turn, directly cause tooth-ache. There are, however, many constitutional influences which promote the course of tooth-ache, and which thus indirectly produce it. It will be apparent, for example, that whatever tends to increased acidity of the oral fluids will in this manner eventually produce first, decay, and then this pain. And this tendency will be found in connection with almost any functional disturbance, and more especially with disturbances of the stomach.

It is customary to refer a diseased condition of the teeth to derangements of the stomach. This is reversing the facts: and it will be found, on the contrary, that while disease of the stomach affects the teeth but

slightly; and never directly causes tooth-ache, the teeth in all their stages of disease both directly and indirectly affect the stomach.

There are also many influences which excite tooth-ache when the predisposition has prepared the way. When the periosteum of a tooth is in a state of chronic inflammation, many things will aggravate it; especially such as produce debility. The pressure of food, as before mentioned, upon the exposed pulp; the action of the oral fluids; hot and cold drinks, or other liquids taken into the mouth; and many other agents will directly excite odontitis. And both this pain and that of periodontitis will also be directly and indirectly produced by a cold; and sometimes by indigestion and other causes, the most notable among which is pregnancy.

During this period the tendency to tooth-ache is so great as to be, with some, almost its first indication; and it has a greater tendency than at any other time, not only to become erratic

and sympathetic, but to be more keenly felt. When it is remembered how almost universally this state is accompanied by increased acidity of the oral fluids, it occasions no surprise when decay and the pain that ensues from an exposed nerve is produced. For with this increased viscosity we are to expect the destruction of the teeth; and even in a pulp that was before exposed, but had not become inflamed, that immediate irritation which would have been postponed for a time had these fluids remained in their normal condition. Nor is it surprising that the pain from an inflamed pulp should be more severe while it was excited by an irritant of unusual strength. But why the periosteum of a dead tooth, which would have remained in a chronic state, for a time at least, should be so easily excited by this condition, is not clear; and the pertinacity of both kinds of tooth-ache pains, and other peculiarities which they exhibit, is not so easy of solution. For instance, the

prevalence at this period of the short and stabbing, but not so often continuous, pain, which so usually precedes a severe attack of odontitis; as if the pressure of the arterial and capillary vessels upon the nerves were quick and severe, and were then as suddenly withdrawn. It cannot be attributed to hyperæsthesia, for this is not especially noticed to accompany pregnancy.

Observations suggest that an occasionally exalted arterial action (more frequent at this than at any other time) which suddenly propels more blood into the capillaries of the pulp or the periosteum than can be readily transmitted through its impaired organisation, may possibly be at least *one* cause of the peculiarity. But this suggestion, even if correct, does not explain the cause of the unusual sympathetic action of tooth-ache during pregnancy, which still remains somewhat obscure.

When continuous pains arise in any part of the face or head which cannot be directly traced

to some lesion other than in the teeth, these may be examined with the greatest confidence as to their being the cause of the malady. And if not immediately found, the conclusion must not be that the pain does not so originate, but that the examination has not been thorough.

In examining the teeth, a small mouth-mirror and a few fine dental instruments, such as are readily obtainable at any of the dental depôts, will be found indispensable.

When the mouth is looked into, although the presence of a decayed tooth is at once apparent, it by no means follows, nor is it to be assumed without further investigation, that it is the one from which pain proceeds. For the pain may arise from some other tooth, and the extraction of the one apparently offending will thus furnish no relief; and in some cases it may even aggravate the pain; and the erroneous conclusion may in this manner be come to, that it is not tooth-ache, but an unmistakeable nervous affection. No matter how many decayed teeth there may be

in the mouth, although the retention of any one of them will be the worse for its health, the particular offender, when there is pain, should be searched out.

Some idea of the character of the pain may be gathered from the symptoms. But when the symptoms are not clearly defined, and the teeth have to be examined in order that the malady may be determined and treated, it is best to first press with the finger upon such, if there be any, as appear to be decayed ; and if there are none in which disease is visible, then upon all of the the teeth ; since if upon the application of pressure to any one, the pain is increased, this is the unmistakeable offender, and it is a case of periodontitis. The same conclusion may just as safely be come to when any tooth begins to feel too long, and gives pain whenever the teeth are closed. If, however, no teeth that appear to be decayed respond to the pressure, it may be applied to all the teeth

in succession ; whereby the disease will not infrequently be found in a tooth that is quite unaffected by decay. This mode of testing for periodontitis so certainly reveals the presence of the disease, when it exists, that it may be assumed as pretty clear that when no tooth or root is sore to the touch, the pain arises from an inflamed pulp : although when the inflammation of the periosteum is sudden and severe, there may be much pain before this test reveals its locality. The seat, however, will be determined in the course of a short time.

If pressure does not detect the aching tooth, and there are several teeth decayed ; then, (commencing with that which from appearances is most likely to be the one that is aching), by cutting away the decayed dentine near the orifice, so as not to disturb the pulp more than is necessary, if it should be exposed and inflamed, it can soon be determined if that tooth has lost its vitality. If there is no sensa-

tion in the dentine, and further excavation of the tooth reveals that it is not aching by reason of an exposed pulp, but is devitalised, the absence of pressure shows that the inflammation has not yet reached the periosteum, and that, therefore, the cause of the pain is to be looked for in some other tooth; and every affected one may be examined in like manner until the seat of the pain is determined.

Even if a case of periodontitis is discovered, it by no means follows that this is the sole cause of the pain. For it is frequently found that more than one tooth is so affected when there are many badly diseased teeth; and that it is often accompanied by odontitis. The combination of these two pains results in such severe and unusual suffering (which is almost certain to extend far beyond the mouth), that it often gives rise, from its complicated character, to what seems to be the most incontestible proof of the neuralgic theory.

While periodontitis is usually soon discovered and located, it must be remembered that odontitis is often most obscure. And when after one examination, or even repeated examinations, the pain continues, instead of concluding that it is not tooth-ache, the search for the cause should be renewed.

Sometimes the pulps of two or even more teeth will be exposed at the same time; and if only one is discovered, although it may be destroyed, the other will continue to ache.

When it is found that the suffering is not from periodontitis, the removal of the decayed dentine will soon determine in which of the decayed teeth the disease has so far progressed as to reach and inflame the pulp.

It frequently happens that, although the pain is intense, all the teeth appear to be sound; or none that are seen to be decayed are found to be the seat of the pain. When this occurs, it is first to be observed if there be any appearance

of discolouration through the enamel, at or near the approximate surface of any tooth, when a powerful light is thrown upon it by the aid of the mouth-mirror. Oftentimes, when there is decay in the sides of the teeth, it will in this way be apparent to anyone ; but as a rule, this test is not of much use to any but the most experienced and keen-eyed dentist. If no discolouration is observed, the teeth should be probed with a fine instrument, when the decay will often be discovered in the most unexpected place.

- If the surgeon or dentist is unable to discover the seat of the pain, he must not (as is more frequently done than acknowledged), extract any tooth at random ; for he runs but a small chance of affording relief, and may remove a valuable tooth which ought to be retained. Nor, either before or after this operation, when the pain continues, because he cannot locate it, must he conclude that he has dis-

covered a case of *tic*. He must be satisfied to know that he has failed to discover the decayed spot or other cause of the suffering.

Very frequently also there will be no disease in the mouth except in some very small and apparently insignificant root, and even that one only very slightly sore to the touch. And yet this may be the sole cause of very severe pains in the face.

TARTAR.

THIS is a deposit almost wholly composed of lime and animal matter in various proportions, frequently found upon the teeth. Its source and mode of deposit are uncertain. Dr. Harris gives an excellent summary of what is known on this subject, and declares that,* “the conclusion appears to us irresistible that this earthy matter is chiefly a salivary deposit, and takes place in the following manner: It is precipitated from the saliva, as this fluid enters the mouth, upon the surface of the teeth, opposite the openings in the ducts, from which it is

* Op. cit. p. 451.

poured. To these its particles become agglutinated by the mucus always found, in greater or less quantity, upon them. Particle after particle is deposited, until it sometimes accumulates in such quantities that nearly all the teeth are almost entirely encrusted with it." When first deposited, tartar is soft and *creamy* in its appearance; but if allowed to remain, it loses a portion of its animal matter and water, and, as the lime predominates in its composition, becomes harder, and clings with great tenacity to the teeth.

The adhesion of the tartar to the teeth does not directly induce decay; but indirectly, through the irritation of the gums which it occasions, it greatly promotes this malady. The deposit of tartar usually commences on the teeth at the edges of the gums. While soft, it does not much interfere with these structures; but as it gets harder the gums are irritated and become inflamed.

There may be remote constitutional causes which favour the irritability of the gums, but a local irritant is necessary for its active development. Tartar is the agent which almost always causes this disease; although it is not infrequently owing to the presence of dead teeth, badly-inserted artificial teeth, improper fillings, and other causes. Koecker, whose practical good sense is almost unrivalled among dental writers, says that he has not observed the devastation of the gums and sockets of the teeth without the presence of tartar; and the author's observations go to show that he is very much nearer the truth than is generally supposed.

The effects of the inflammation of the gums by tartar is to cause them to swell, become sore to the touch, easily bleed, and finally suppurate; whereby foetid matter is discharged, first polluting the breath, and then mixing with and vitiating the oral fluids. As the suppura-

tion continues, the gums recede ; and in this manner they would clear themselves from the tartar and resume their healthy condition, were not new deposits made upon the previous accumulation, whereby its advance is constantly pressing upon the retreating gums.

This has not long to continue before the sockets of the teeth also become involved ; and the result, if the tartar be not removed, is that gums and sockets are destroyed, the teeth are devitalised and become loose, periodontitis and sometimes odontitis ensues, and finally the teeth drop out.

When tartar is in its soft state it is easily removed with a brush ; but when it has become hard it can only be removed with instruments. The operation of removing the tartar should be performed, even by the ordinary dentist, at the cost of little or no pain, and without much fear of the slightest injury to the teeth.

As this deposit from the saliva is composed

chiefly of lime, and is readily soluble in acids, it is customary to introduce some agent of the acidulous character into tooth-washes and tooth-powders, alike for this purpose and for the use hereafter mentioned. But whatever will act chemically upon tartar will also destroy the teeth ; and any attempt to remove the tartar in this manner will directly induce decay.

The common operation of “scaling the teeth,” while in the right direction, is one which seldom if ever meets the requirements of the case because of its lack of thoroughness. By this operation, the greater portion of the deposit is often removed ; but that is of little real advantage if, as usually happens, nothing more is accomplished. It is the small particles which remain embedded under the gums and between the teeth, and which are not seen until after the first or second sitting, that do the greater part of the mischief. These, in the ordinary operation of scaling, are not reached ; since to

reach them is impossible previously to the removal of the bulk of the tartar, and until the bleeding of the gums has ceased, and the swelling has subsided. They are consequently left, in almost all attempts to clean the teeth, to act, not only as insidious and potent irritants, but as nuclei for renewed deposits.

After the excitement and the bleeding of the gums, consequent upon the first operation, has subsided, which will not be until some days have elapsed, the process of removing the tartar should be continued and repeated until *not a particle remains.*

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THE PREVENTION OF TOOTH-ACHE.

THIS is a subject which it will be well to consider before that of Cure.

If treated in an exhaustive manner, it is one that would extend quite beyond the limits of such a treatise as this ; for it would lead to the consideration, not only of the best means of preventing the derangements which ultimately induce tooth-ache, but would carry our enquiry back to the hereditary tendencies in general ; and to a particular consideration of the regimen necessary to the mother as well as to the child, at the period when the food and health of both had powerful influence upon the organisation of the teeth. It

would lead also to other extended questions. Our enquiries must be limited accordingly, to the prevention, as far as possible, of those diseases of the teeth which arise after they have emerged.

It has been seen that tooth-ache is the result of the exposure and the consequent inflammation of the pulp through decay; and of the devitalisation of the tooth through this action, the effects of tartar, injuries, and so forth. To arrest and prevent further decay is to leave, accordingly, but little opportunity for the exhibition of tooth-ache; and to remove and to prevent the accumulation of tartar is to leave scarcely any.

Inasmuch as when the teeth are once formed, their vitality and strength of character are fixed; and, so far as their innate organisation is concerned, they are not liable to vary in their tendency to disease; all efforts for the prevention of decay are utterly useless which aim at any supposed possible increase in their

vitality that would give them greater power to resist the attacking forces.

The first efforts of the dentist, which have for their end the prevention of disease in the teeth, will be directed to the teeth of the child ; and especially at that period of its life when the permanent teeth are assuming their positions. These efforts consist in aiding nature, when necessary and possible, in the arrangement of the teeth after the manner she designs : for when they are uneven, the accumulation of food about them is much greater than when they are regular ; and when they are crowded, the constant attrition wears away the enamel upon their approximate surfaces.

It is also matter of observation that, however sound and clean the teeth may be, the gums about a tooth that is not in its proper place will always present an angry appearance.

This is not the place for an elaborate dis-

quisition upon the mode of regulating the position of the teeth: there are, however, a few general propositions to be made, which are pertinent to the present subject, and which can be comprehended, and will be readily appreciated, by any mind of ordinary intelligence.

It is in "regulating the teeth" that dentists so frequently exhibit to the anatomist, if not to patients, the entire and almost universal absence of the anatomical knowledge so essential to those who have to deal with the human fabric; and efforts in this direction are often made, not only in ignorance of the wonderfully wise arrangements of nature, but in utter defiance of their provisions.

When we consider how wonderfully perfect is the progress of the formation of the teeth from the rudimentary pulp;—when we consider, moreover, the growth of the two sets, the displacement of the first by a portion of the second, and the perfection and beauty of the final arrangement of the latter in the mouth—whereby order is brought, in the most wonderful manner, out of

what seemed to be hopeless chaos,—it must needs be obvious to the dentist who reflects, that his paramount duty is to prevent any interference with the orderly operations of nature. To perform this duty effectually, he must first acquire so thorough a knowledge of dentition as to learn, what so many seem ignorant of, that this is his line of duty: and he must be possessed not only of intelligence but of a conscientious and child-loving spirit.

The little patient will then perceive that the efforts are all made for its good, and that the trouble and annoyance are not more than are absolutely necessary. Convinced of this, it is often astonishing what children will submit to, and easily get through.

Much decision, with those who have the charge of children, will also be often found necessary; since nothing is more common than for parents and others to become alarmed at the peculiar and ragged appearance of the mouth during second dentition, and to think that something must be done to the teeth, and that they are becoming displaced, when the progress of the replacement of one set by another is exactly what is desirable. It often happens indeed, that the most favourable indications are regarded with the most alarm.

Very frequently also, children are taken to the dentist for the purpose of obliging them, whether they will or no, to have different kinds of operations performed. No man—that is fit to be called a man—will become a party to such undignified scenes as are sometimes enacted. Nor will any gentleman fail to resent the request that he shall assist in deceiving a child, as a gratuitous insult. What is really necessary almost any child can be reasoned into having performed; and operations attempted against its will throws it into such a state of terror that they cannot be properly, if at all, accomplished: so that deception and coercion are without excuse. Moreover, while a child will submit to almost anything from those in whom it has confidence, once deceived and tortured, its dread of the dentist remains throughout life; and other effects are also produced which it is the end of all good education to prevent.

The first set of teeth consists of twenty, ten to each jaw; and these are displaced by the same number of somewhat larger permanent teeth. The second, or permanent set, as shown above, consists of thirty-two teeth, sixteen to each jaw.

The space for the additional number, and the increased size of the permanent set, is attained in

various, and in some respects, peculiar ways. All that portion of the jaw where the first teeth are placed—which, until the molar teeth begin to arrive, is indeed, the whole of the jaw—may be regarded as having very nearly attained its normal growth when the first teeth have emerged. Nevertheless, there is a very perceptible increase at the middle line and in the vicinity of the cuspid teeth, and a slight general increase, by the time the permanent teeth begin to appear. Most, however, of the additional space required for the permanent teeth which displace temporary ones, is attained by the new position they assume.

The temporary teeth are arranged in a vertical position, as shown in Fig. 6 ; the effect being to bring their crowns together, while the roots will be wide apart, leaving some unoccupied space, so to speak,

Fig. 6.



Lateral or side view of temporary superior front incisor.

in the jaw. The new teeth, on the contrary, assume a somewhat oblique position, as shown

Fig. 7.



Lateral view of permanent superior front incisor.

in Fig. 7 ; the consequence of which is that the crowns are thrown further out, and the arch formed by the cutting edges of the teeth is larger than the jaw ; while the arch marked out by the roots corresponds to the jaw and is not much greater than before, if at all so. In this manner the larger crowns of the new teeth find the room which would otherwise not have been possible.

It will also be observed that the new teeth are so shaped in the crown as to preserve the same appearance as if their roots were vertical.

While the new teeth are forming in the jaws, the lateral incisors and the first bicuspid lie pretty close together, and the cuspids stand outside of the necessarily contracted arch described

by the other teeth. It appears, accordingly, that space amounting to almost the whole width of these latter teeth must be obtained for them. Some space is got by the slight general increase in the jaws and the particular increase at the middle line ; and more yet, than to the best of the author's belief has been pointed out by previous writers, by a decided increase in the jaws at the point of the emergence of the cuspids.

When watching the progress of dentition, it should not be overlooked, however, that not quite so much room is needed as would be the case were the cuspid teeth so placed that the front teeth would form a rounded arch. When it is observed that the permanent cuspids, in a well-arranged set of teeth, are a little more prominent than the others, thereby giving a somewhat flat appearance to the arch described by the front teeth, it will become evident that their position while forming, was but preparatory towards the arrangement, which, on their emergence,

culminates in giving the whole of the teeth, and the face likewise, that greater prominence at the point the cuspids occupy, which is essential not only to the conversion of the juvenile mouth into the adult one, but to the conferring of that character upon the face which is indispensable to the expression alike of force and beauty. It is because this is not observed, that so many extractions and other mistakes in treatment take place. It will also account, to a great extent, for the peculiar and unnatural expression given to the mouth by almost all artificial teeth. The emergence of the cuspid teeth slightly upon the outside of the arch formed by the other teeth, is also one great cause of the increase of the jaw at that point.

So far then, from the appearance of the cuspid teeth on the extreme outside of the jaw, which usually excites so much alarm in parents and dentists, being an unfavourable indication; in almost all cases it is just so much evidence that

the teeth are emerging in a way to give plenty of room : and from this it follows that not only are they more likely to become regular in arrangement, but that decay will be less likely to arise.

The space for the whole twelve additional molar, and largest teeth, is obtained by positive growth in the posterior portion of the jaw. And the great increase of the jaws in this direction completes the conversion of the child's mouth and face into the adult's,—a change which was commenced as above described.

The jaws, then, from the beginning of growth to the completion of dentition, are at one point or another constantly increasing in size so as to accommodate the teeth which have been formed in their remote parts. And as the increase is effected for this purpose, it will be found progressing under the influence of the development of the teeth ; and in conjunction and harmony with that development. When the said in-

fluence ceases, so, in great measure, does the growth of the jaws.

It is evident that when there is irregularity of the teeth, it is owing to the disparity between the space they require and that which is provided for them. This disparity must necessarily arise either from the teeth being too many or too large, or else from the jaw not having sufficiently grown to receive them. As it is only in extremely rare instances that the teeth exceed the normal number; and, as it can never be consistently said that they are too large, *it is to deficiency in the size of the jaw alone that we must look for the cause of irregularity.* It is clear, therefore, that the entire efforts of the dentist should be primarily directed to such treatment as will not in any way impede the natural growth of the jaws; and when there is a tendency to irregularity, to such treatment as will, as far as possible, promote their growth.

As, therefore, the jaws are forced, as it were,

to grow by the crowding forwards of the teeth which have been formed in their remote parts ; under no circumstances, except as a very last resort and an indispensable necessity, should a tooth be extracted until the jaw has developed to its full size: for it must be evident that the growth of the jaw is thereby impeded, that the room for the teeth is lessened, and that liability to irregularity and to decay are just in the same measure increased.

A most remarkable case of "regulating the teeth" was one where the temporary teeth of the lower jaw had been extracted by an ignorant fellow for "tie" (!) So much had this retarded the growth of this jaw that it was much smaller than the upper one ; and the second teeth were not only crowded, but even the bicuspid shut inside the upper teeth. The effect was to give the patient a most unsightly appearance.

The importance, indeed, of retaining not only all the temporary teeth, but also the permanent ones while dentition is in progress, or at least until the second or middle molars have acquired

a firm position in the mouth,—say until about the fifteenth year, or a little later,—should never be let slip from the minds either of parents or dentists. To this end, when the first teeth decay and the child will allow them to be filled, they should be so treated before the pulp becomes exposed. Tin-foil, and in perfectly healthy patients even amalgam, may be used. But the time required for gold is too tedious for the child. If the pulp is exposed, it may be destroyed and as far as possible removed; and the tooth afterwards filled. Should periodontitis at any time after this set in, the removal of the filling will in general relieve the pain a good deal. If not relieved by this, and the patient will allow the operation, an opening may be made into the abscess through the root, whereby the pus will be discharged into the tooth. If no relief to the pain is thus obtained, then a tenth to one-half a grain of quinine every hour, a few times repeated, will have the desired effect.

It is, however, when the new teeth begin to appear, that if anything be required, most can be accomplished towards assisting them into their proper positions, and preventing liability to decay. It is at this period also that mischief is so often inflicted.

In reference to this matter Dr. Koecker pertinently remarks* that "Irregularity of the teeth is one of the chief predisposing causes of their diseases, and never fails, even in the most healthy constitution, to destroy, sooner or later, the strongest and best of teeth, unless properly attended to."

And Harris† as emphatically declares that "It is important that the mouth during second dentition, should be properly cared for; and so thoroughly convinced is the author of this, that he does not hesitate to say, that if timely precaution were used, there would not be one

* "Principles of Dental Surgery." p. 188.

† Op. cit. p. 138.

decayed tooth where there are now a dozen. Much harm, it is true, may be done by improper meddling with the teeth during this period, but this so far from inducing a total neglect, should only make those having the care of children more solicitous in securing the services of scientific, accomplished practitioners."

With a laudable desire to have all that is practicable done for their children, parents are very naturally inclined to consult a dentist at this period. The practitioner called upon will generally find that his sole duty, when intelligently performed, is the pleasing one of calming the fears of the parent; and of pointing out that the progress of dentition is going on in the way that could be wished; or, if there be only a slight defect apparent, that nature, in her wise and curious ways, will do much more towards curing it than the dentist can, however skilful. He will also feel it his duty to impress upon parents how imprudent—and it is not too much to say how wicked—it would be to interfere, except under the most imperative necessity, with an arrangement so wonderfully perfect.

From a variety of causes, such as protracted illness, and so forth, it is not infrequently

found that the growth of the jaws has not kept pace with the development of the teeth; and that they begin to emerge from the gums rather crowded and out of place. In most cases time will give the jaw opportunity to develop to a sufficient size; and it should not at once be concluded, that because the jaws are not large enough when the teeth begin to appear, they will not become so, in due course, provided they be left to themselves.

But in some cases, owing to the above causes, to hereditary tendencies, and so forth, the jaws are *not* inclined to grow to a sufficient size. Here the aim of the dentist should be to induce or stimulate the necessary development. In so doing, he is but assisting nature; such development, as we have seen, being what she is employed upon when the teeth are pressing forward into their respective positions. And he must take great care to render this assistance at the proper time and in the proper place.

Instead of so doing, however, the usual practice is at once to extract a tooth or teeth, so as to "make room." Such a course, instead of promoting the desired end, retards the growth of the jaw; and this too where, if the teeth were left alone, in a majority of instances they would have come as they ought.

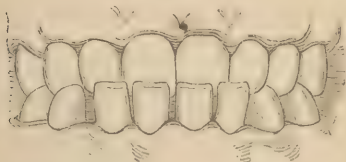
In this mania for "making room," the tooth sacrificed is generally one of the bicuspids; which, even when extraction must be resorted to, are not the teeth to lose if it be possible to save them. And even a cuspid tooth is not infrequently removed; the teeth subsequently presenting the appearance exhibited in Fig. 10, on page 152, where the cuspid has not yet shown itself on the right side of the mouth.

A glance at the figure will show that this is the height of charlatanerie: and it is proper to add that the dentist who has no clearer perception of his duty than lets him disfigure a mouth in this way, is unfit to be entrusted with a juvenile, if indeed with any patient. Yet it is mortifying to have to say that this is by no

means an uncommon occurrence. The author possesses models of several mouths which have been treated in this manner; and drawings of which would have been inserted had not the one referred to sufficed to show the appearance of the deformity, so far as the teeth are concerned. But the effect of the extraction of the cuspid tooth is not confined to the appearance of the teeth; it is also very marked in that of the face when the mouth is closed.

The points where the jaws are deficient, vary; and although always attributable to a similar cause, the peculiarities of irregularity are considerable. For example:—the whole of the

Fig. 8.



front upper teeth sometimes take a more vertical direction than nature designs they should, and shut inside the lower teeth, as seen in Fig. 8. The jaw is then said to be “underhung.”

More frequently only one or two superior front teeth take this direction. When the upper front teeth once shut inside of the lower ones, they are crowded inwards each time the jaw closes. The lower teeth are at the same time forced outwards, whereby the deformity is increased and rendered permanent.

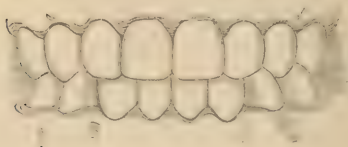
That the lower jaw should be underhung, is by no means so much owing to abnormity in shape or size as most dental writers seem to consider. Rather is it that the upper teeth, having at first just barely caught inside the lower front ones, press these teeth out at each occlusion of the jaws, whereby they are caused to project more than is natural; and generally also, the under-jaw has to be thrown unnaturally forwards so as to allow of the meeting of the molar teeth. In this manner, not only do the front under-teeth project beyond their usual position and cause protrusion of the lip; but the proper relation of the under-jaw, not only to the upper one but to the whole face, is abnormal; whereby the unnatural projection causes that greater size of the lower part of the face which appears to be owing to an increase in the size of the lower jaw. That after the front teeth have been thus forced out (and the other lower teeth antagonise with, and shut outside of, the upper teeth that were intended to meet those of the

lower jaw which are situated further forward), the under jaw is sometimes found increased in size, is true enough. But the appearance of unnatural size is always owing very much more to the unnatural position it has been compelled to assume than to an actual growth.

The remedy for such an irregularity is to insert in the mouth a plate made of vulcanised india-rubber securely tied to the other teeth, between which and the teeth a wooden wedge is inserted. The expansion of the wood by moisture will force the teeth into place. A metal plate, provided with an inclined plane for the irregular teeth to strike upon, will in some cases also conduce to the desired result; and then, the upper teeth being once made to shut outside the lower ones, as is natural to them, both upper and lower teeth will in a short time assume their normal positions. The case represented in Fig. 8 was so treated; and in nine or ten days the upper teeth were got to shut over the lower ones. In a few weeks the irregularity

had been so far remedied as to present the appearance seen in Fig. 9.

Fig. 9.



Another excellent illustration of the occasional necessity for forcing the growth of the jaw, is shown in Fig. 10. Here, all the temporary

Fig. 10.



teeth have been shed ; and the permanent teeth have emerged as far back as the first molars ; excepting the right superior cuspid, which has not yet shown itself through the gums, although the increase of the jaw indicates that it is coming forwards. Left to itself, this cuspid tooth would emerge upon the outside of the arch, and present a tusk-like and extremely unsightly appearance. The cause of the irregularity was evident, and the remedy was the increase of the jaw.

Fig. 11.



This was effected by means of a vulcanite plate and wedges. The first bicuspid teeth on both sides were first brought out; then the right front incisor; and lastly, the right lateral incisor. This gave the appearance and the space seen in Fig. 11; and here, at the time of writing these words, the case rests. When (as far as is possible in the present condition of affairs) the right superior cuspid shall have come into place; and the jaw, under the stimulus it has received, has increased all that it will by natural growth, still further progress will be made. Great care was of course taken to preserve the first molars.

At about the sixteenth year, when the second molars shall have become well fixed, the first molars will be extracted. The teeth in front of them will then fall into order and regularity. It is seldom that we find so difficult a case as the one here presented; and regulating is usually a much simpler affair; and as in the

other case illustrated, more easily managed. It shows what can be accomplished, and that *extraction of any sort, while the jaw is yet growing, is unnecessary and improper.*

In irregularity, some slight assistance to nature in arranging the teeth in position will usually be all that is required; and for this purpose, no teeth need be removed, except in very rare instances. For where no teeth have been extracted to "make room" and the jaws have been thereby allowed to grow in the proper manner; and, when necessary, judicious appliances have been put into the mouth to assist the teeth into place, space will almost always be found quite, or, at all events, very nearly sufficient for all the teeth.

But when all the teeth have emerged, except the posterior molars, and the jaws have ceased, or have nearly ceased, growing; and notwithstanding all efforts to the contrary, they are then found to be irregular, a new view of the

matter is to be taken. The cause of the irregularity as we have shown, is invariably the smallness of the jaws; and not the space demanded by the teeth. And just so long as either nature or art can promote the growth of the jaws, this is the only course to pursue in order to remedy the defect.

But when the jaws will no longer grow, and all available space for the teeth has been procured, should the jaws still not be sufficiently large, and should the teeth still require more room, then, *but not until then*, the only plan is to reduce the space which the teeth demand to the dimensions which it is now found that the jaws are able to present.

In entering upon an explanation of the proper manner of adjusting the space required for the teeth to the dimensions presented by a contracted jaw, it is first proper to observe that it is not the new front teeth that are usually the first of the permanent set to appear as is by

parents generally supposed. Before, as a rule, any of the old teeth have been shed, the first molars of the permanent set—the posterior teeth seen in Figs, 10 and 11—have emerged.

This fact is one that should be more noticed by surgeons and parents (not forgetting many dentists). The first molars appear about the sixth year; and the parent may always suspect that the child has got these teeth when there are indications that the old ones are beginning to depart. If there be any doubt as to whether or not they have yet appeared, the question may be settled by simply counting those that are in the mouth. As there are ten temporary teeth in each jaw, there are five upon each side of the jaw. If, on either side of either jaw, in addition to these a sixth tooth is found, the last is certainly a permanent one.

These are frequently mistaken for temporary teeth; and are allowed to decay—and are even extracted—without any suspicion being entertained of their true character.

It is also proper to observe that while the second dentition is in progress, the oral fluids are in a somewhat more viscid condition than usual; indeed, under the circumstances, it cannot be

otherwise. And as the first molars are not only formed at an earlier age than the other permanent teeth, but occupy their places in the mouth during the whole period of the second dentition, they must needs be much more liable to decay than any other teeth. Statistics prove, in fact, that of all the permanent teeth the first molars are by far the most liable to decay. If there be tendency to decay, these teeth accordingly will be found to be affected by the time that the old teeth are lost and new ones are in their places; especially if the permanent set be crowded and irregular: and in this manner they give unmistakeable indications that if any teeth are to be lost, it will be themselves.

When, accordingly, it is found, after all the efforts to increase the jaws have ceased, that irregularity still exists, and that resort must be had to the plan of reducing the spaces required, these teeth, and no others, are, almost without exception, the proper ones to be extracted.

And furthermore, the extraction of the first molars (as these teeth are of large size), will, in almost every case, be all that is required, alike to bring the teeth in general into place, and to obviate the pressure which would otherwise eventually produce decay.

There is no excuse for the great ignorance displayed by dentists as to the importance of looking to the first molars when it is necessary to make extractions in a mouth where the teeth are irregular; since from the time of Koecker (by whom attention was first drawn to the subject) it has been a clearly established rule of practice.

Such facts as that the first molars are so much more liable to decay than the other teeth; the tendency to decay produced by attrition when the teeth are crowded; and the insidious and destructive progress of decay when it commences on the contiguous surfaces, especially of the back teeth, leads also to the consideration of some conditions which may not always be accompanied by positive irregularity, but which

bear quite as directly upon the subject under review.

If, when all the teeth excepting the last molars are in the mouth, they are crowded,—although there may not be much irregularity,—this will induce in teeth that are not very strong, for the reasons above named, a decided tendency to decay upon their contiguous surfaces.

It is comparatively easy to fill the teeth upon their grinding surfaces, even with gold ; but it requires more skill than is usually exhibited, to successfully arrest decay when this begins upon the contiguous surface. For this reason, and because not so readily seen in this part of the tooth as when occurring upon the grinding surface, decay is often overlooked until the cavity has become very large ; and then it is usually “stuffed” with amalgam. It is no uncommon thing to see very fair gold fillings on the grinding surface of the teeth, inserted in a mouth where there had been no effort to arrest decay on their contiguous surfaces ; or where, if attempted, it had been a wretched failure.

When the jaws have ceased growing, and no more is to be gained by delay, should the first

molars be found much decayed, and the other teeth be inclined to decay upon their contiguous surfaces, the mouth should be treated in such a manner as will ensure the preservation of the *greatest number of teeth for the longest period of time*; and this must be done with as little trouble and pain to the patient as possible.

The increase in the tendency to decay which will be promoted by the crowded condition of the teeth; and the actual beginning of decay such as will generally be found, when the teeth are crowded, to have taken place in the first molars—and not infrequently upon the contiguous surfaces of the other teeth—by the time that the second dentition is about completed; shows at once that, if left to the ordinary course of events, many of the teeth will certainly be soon lost. And even when fillings of the most perfect kind have been inserted, the loss of the teeth will not be altogether prevented; for it

will be found almost impossible to completely arrest decay upon the contiguous sides of teeth which, however large the intervening space at the time of the operation, will, in a few weeks or months, be found again closely crowded.

Looking forward then to the ultimate preservation of the greatest possible number of teeth,—having persistently retained the first molars while the jaws were increasing and thereby secured sufficient room for at least the remaining teeth;—it will be found that when there are evident tendencies to decay upon the contiguous surfaces of the teeth, the removal of the first molars will allow those which remain to spread out over the jaws; thereby relieving their crowded condition, and thus reducing this tendency in a most decided manner: and, in ridding the mouth of these diseased teeth, which, through the effects of the decay, are powerfully aiding the viscidty of the oral fluids,

the tendency to decay in the remaining teeth is still further reduced.

In short, if the principles of this treatment are understood, and it is carried out in a firm and intelligent manner; in most of the cases in which the teeth have a tendency to decay, it will suffice so far to counteract the tendency in question that the prospective loss of the teeth will be reduced from a certainty to a contingency.

In order to be successful, however, from the beginning there must be neither mistakes nor deviations. This granted, it is not too much to say, that in the mouth where decay is a certainty, the dentist thereby lays a broad foundation for the future health of the teeth and mouth; and he does more to preserve the remaining teeth, than, in many cases would result from all his other efforts (allowing even that he be most skilful) in a mouth in which the first molars were either extracted at ran-

dom, or were allowed to remain and keep the teeth in their crowded condition.

And the dentist, however skilful he may be in filling the teeth, achieves his highest usefulness, and to the greatest possible extent prevents decay, when he so well understands the mode in which the teeth develope and the causes that must lead to their decay, that he is prepared to properly treat the mouth up to the point when the jaws cease to increase. And however desirable may be all other acquirements, it is in preventing disease that the highest are most needed; and where his practice is most scientific and most satisfactory.

Because also of the treatment we have described, the fillings inserted on the contiguous surfaces of the teeth will be found to preserve them very nearly as well as in any other part; which is not possible when the teeth are so much crowded that they cannot be kept clean.

It is often extremely difficult to convince a person of the danger he has escaped, or of the serious contingencies he has avoided ; or to show a patient, especially where immediate pain is involved, that a preventative is the best treatment. Although this is of the first importance, it becomes, therefore, exceedingly difficult to pursue any systematic plan in extractions, owing to the natural reluctance of the patient to suffer except to relieve present pain.

Tooth-extraction has been rendered much less painful since the introduction of Mr. Richardson's most admirable ether-spray apparatus. Patients who previously were unable to endure this operation, are now able to sustain it. For if not altogether relieved of pain, the suffering is so much mitigated as to be quite bearable.

It is not, however, altogether owing to the patient that teeth are so commonly extracted only under the impulse of severe pain ; or that it becomes so difficult to pursue a systematic plan in extraction. It is to be largely attributed to the general ignorance of dentists.

An excellent illustration of the difficulty of pursuing any such plan as has been above specified, or indeed of any arrangement based on the principles of common sense, so long as dentistry remains in its present condition, occurred to the author while this work was going through the press. A juvenile patient had been under his care for some years, and the first molars were carefully retained; although one of them was much decayed and devitalised, and had given decided indication of periodontitis. But in order that the jaw should grow, this was left until it *must* be removed. When this time arrived, the patient happened to be near London, and was taken to a person who has a high name and a great practice. He not only removed this tooth, but the adjoining second bicuspid, which was perfectly sound; assuring the patient, after it was extracted, that it had an ulceration at the root, although this tooth could not possibly be devitalised!

Thus, in a moment's time, was all the care that had extended over years, rendered useless!

Had the upper first molar been removed, no more than two teeth, as now, would have been lost: and in time the remaining teeth would have spread over the jaw, and relieved all the pressure and attrition, as seen in Fig. 13: whereas there is now the space of two teeth vacant on the lower jaw,—one more than in Fig. 12—the crowding of the upper teeth is increased, and rapid decay will be the inevitable result. Had this mortifying blunder occurred in the hands of some village druggist it would have excited in the author's mind no surprise.

and no more vexation of spirit than what came from the thought of his patient's loss. But when it is known to be a fair representation of the ignorance of so many of those whom—because they may perchance through some means attain a practice—the credulous and uninformed public are led to regard as leaders in a noble profession, it is sickening to think that there are yet no means whereby the intelligent dentist may be known from the empiric.

In treating a mouth, whatever is done, the future condition of the teeth is a consideration that should never be lost sight of for a moment by the dentist ; and hence, whenever extraction is resorted to, it should be practised with the view of removing as few teeth, and saving as many useful ones as possible ; and of avoiding to the last moment, the necessity for artificial teeth.

While the unlearned dentist is ever ready to extract the temporary teeth ; and also the new ones—even when quite sound—while they are emerging and just at the time when he should leave them alone ; on the other hand, he is ever afterwards found just as persistently wrong in allowing, and even advising, the retention of the decaying teeth and of their roots.

It is by no means uncommon to find a mouth in which either the first or second bicuspid has been lost, and the first molar teeth (which are some four times more liable to decay) "stuffed" with immense quantities of amalgam. And this when it is evident that had the bicuspids been retained and the molars lost, this treatment would have taken from the mouth, if not the whole, certainly almost all, of the decay.

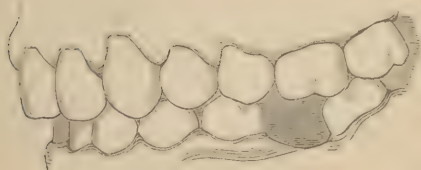
Some illustration of the effects of extracting teeth at random will show the pernicious results; whatever may be thought of any other course.

It should be remembered that the teeth are useful for mastication only in the degree that they antagonise one another; and that when a tooth is lost, the antagonist is as useless as a single glove or the half of a pair of scissors.

It is common to find a mouth in which one of the first molars has been extracted and the other left; see Fig. 12. There is no even balance between good and evil, and what has lost its power for good must have become a power for harm. No clearer illustration of this truth is presented than in these cases. If the

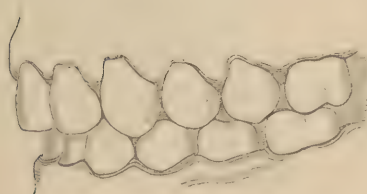
antagonist be allowed to remain, the space in the jaw covered by the lost tooth is also likely to remain, as here seen; whereby not only

Fig. 12.



is that amount of masticating-space lost, but much inconvenience and annoyance often arise from the pressure of the food. Contrariwise, if the antagonist is removed, as is seen in Fig. 13,

Fig. 13.



the teeth spread out over the jaw and the space is closed up; and although some masticating space is lost, nevertheless some is gained over and above what would have remained if but one tooth had been removed.

But the greatest gain is to the remaining teeth. For the health of these there can scarcely be too much intervening space; and that which will be gained in this manner will, in a mouth where the teeth decay rapidly, more than compensate the loss of both molars, even had they been sound. But in such a mouth they will *not* be sound; and if the folly of attempting to permanently retain the first molars, when there is a tendency to decay, is so great, how much greater is the folly of retaining a tooth rendered entirely useless by the loss of its antagonist, as we so often see is the case; and in mouths, too, where the other teeth are nearly all decaying on their contiguous surfaces? These mistakes result in producing just the opposite effect to what is

intended, and the result is clearly seen in after years.

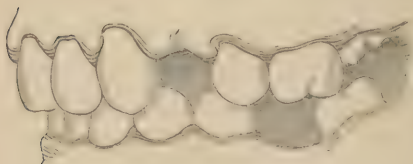
It should be understood that filling the teeth is a purely surgical operation ; depending for success not only upon the way in which it is performed, but upon all the attendant circumstances ; and that one of the most desirable conditions for a filling is that, the patient can keep both it and the tooth clean.

When the teeth are liable to decay, in mouths where the jaw has been prevented from expanding by injudicious extractions, or where the first molars are not extracted when decayed, or only one of them is lost, there will be presented a great variety of peculiarities ; but all will exemplify the principles here advanced.

For an example, refer to Fig. 14 ; which illustrates a case where instead of removing the first superior molar with the inferior antagonist, it was retained, and very greatly promoted the loss of the first bicuspid and second molar ; whereby while only three teeth

are gone, as regards power of mastication, that side of the mouth is almost ruined. It is also seen that, as the superior bicuspid locks upon the inferior bicuspid, and the superior molar upon the inferior molar, the spaces cannot close up,—although the cuspid tooth may move somewhat backwards. Furthermore, as the pressure and attrition of the superior bicuspid and of the

Fig. 14.



remaining molar are necessarily greater than ever, decay upon their contiguous surfaces is certain to end in their loss, in spite of the most careful fillings. Had the proper course been pursued, decay would have been rendered so unlikely by the removal of the pressure and attrition.

that with little expense, and less extractions than have already taken place, the teeth would have presented the appearance shown in Fig. 13.

This could have been accomplished with avoidance also of all the pain from the decay of the first bicuspid and the superior second molar; for even if decay had begun, it could have been arrested by fillings that would have secured the desired end, inasmuch as both they and the tooth could have been kept clean.

Some years ago the author had a patient whose mouth had been treated (not by design, but accidentally) in a proper manner upon one side, but not so upon the other. Where the teeth had been properly removed, there was no decay; but on the side where the extractions had been improperly made, all the teeth in the upper jaw—commencing with the front incisor—and also all the posterior teeth in the inferior jaw, were decayed on their contiguous surfaces. These the author filled, making in all nearly or quite a dozen fillings; the whole, or nearly the whole of which, there is every reason to believe, could have been avoided had the previous treatment been right.

Having reduced, as far as lies in his power, the opportunities for the action of the corrosive agents which decay the teeth, the next efforts of the dentist should be directed to such treatment as will bring down the strength of these agents, and keep them at their minimum. While the best of teeth will decay if these acids reach their maximum strength, very poor teeth may be preserved sound, if not acted upon by an external agent.

Viscidities of the mucus may arise from such remote constitutional causes that it defies all control. It is almost certain to be perceptible during the prevalence of many disorders. And as above noticed, it is notorious how powerful it is during pregnancy, and how rapidly teeth decay during this period.

But the most powerful acids which destroy the teeth may be said to be either of local origin, or to have been directly introduced into the mouth in the form of strongly acrid medi-

cines, and so forth. Whether the oral fluids are acrid or not when first secreted in the mouth, if long retained there they will become so. The increase of the viscosity of these fluids is created by their chemical action upon the food and other deposits about the teeth; also upon the decaying dentine, or whatever else is lodged in the cavity of the tooth; and upon the pus which is immediately incorporated into them when discharging from gums inflamed by tartar or from an abscess. To reduce, accordingly, as much as possible, not only the tendency to decay, but its progress, when once begun, it is imperative with the patient not to allow any substance to accumulate in the mouth with which these fluids can unite and thereby increase their viscosity; or to introduce any direct addition to this viscosity.

Thoroughly to accomplish this end, it is in the first place necessary that all those disorganised substances which can be saturated by

the oral fluids, and all such as are irritants that promote the secretion of pus, should be removed from the mouth. In short, all disease existing in the mouth should be eradicated.

The first step in this direction is to remove all the tartar which has accumulated upon the teeth. While in a soft state the tartar is not much of an irritant; but when it has become hard the effects are most destructive.

Dead teeth and roots also greatly irritate the gums; and should not be allowed to remain in the mouth except in cases to be mentioned, where they are so treated as to prevent alveolar abscess. It has been shown that when a tooth is devitalised, in time it becomes an irritant to the gums and alveolus; and that the matter which is discharged mixes with and vitiates the oral fluids, whereby decay is directly induced. These fluids also saturate the dead and softening dentine, and in this manner become still more viscid. Unless, therefore, these teeth are so treated

as to prevent alveolar abscess, and are also filled in a manner that will prevent further decay, the retention of them can only produce harm in the mouth. In view then of the health of the mouth and of the remaining teeth, those which are devitalised should either be so treated or removed.

Dead teeth and roots are frequently kept in the mouth under the impression that they prevent the cheek falling. When the front teeth are lost the lip falls ; but it would be impossible to detect from the appearance of the face that a posterior tooth had been removed. This objection to the removal of a tooth or roots is therefore no less puerile than mistaken :—it may serve for an excuse, but it never can constitute an intelligent reason. And for a patient to endure the pain and baneful contingencies of diseased teeth on this account, is folly in the extreme.

Even if the loss of a diseased tooth were slightly apparent, the author thinks that its deleterious effects on the health would, in many cases, give the face a more sunken appearance than would result from its loss. When several of the posterior teeth have been lost, there may possibly be some appearance of it in the face ; but this is nothing in comparison to the evils resulting from the presence of so many decaying and dead teeth in the mouth.

Although the unavoidable pain experienced in extraction generally prevents any systematic plan of removing the teeth, the good effects of such a practice have been made obvious. Instead of pursuing such a plan however, we find the natural repugnance to pain frequently catered to by dentists; and what should be only allowed under protest, is often advised as the best. Under no circumstances whatever is the retention of a tooth, after it has become an irritant to the gums, an advantage to the patient. In a majority of instances it will be utterly useless; or if at all useful, this will be trifling in comparison to the harmful effects.

It is a common practice to retain the natural roots when inserting a set of artificial teeth. The reason given for this practice is that they prevent the mouth losing its natural expression.

It is quite true that artificial teeth as usually inserted are easily detected; and especially when the roots have been removed does the mouth wear an unnatural, and

often a most disagreeable expression. But the patient should understand that this is not because of the loss of the decayed teeth and roots; but because of the unskilful manner in which the false teeth are constructed. Where the alveolus has much absorbed, the skilful dentist, instead of inserting artificial teeth nearly an inch in length, as is sometimes seen,—thereby giving the mouth a most unnatural appearance,—will also insert an artificial gum, which will quite restore the natural contour of the face;—except perhaps in the vicinity of the upper cuspids. In so doing, he will not, however, be obliged (in those cases where the lip is sufficiently raised in speaking to show the gums) to resort to the miscalled *gum-coloured* vulcanite which has of late become common; but will replace the lost gum with porcelain substitutes so naturally coloured as to defy detection.

While the excuse for retaining the roots of the natural teeth has not the slightest justification, the patient should also understand that the pain of cutting off and filing down these roots is often quite as painful as their extraction would be.

From what has been said on the subject of decay and the formation of those corrosive agents which cause it, the condition of the roots and gums under such a case of artificial teeth, and how immensely the viscidty of the oral fluids is increased, and how rapidly

decay in the remaining teeth must progress, can easily be imagined. Professor Richardson has well stated the results of this practice.*

“Every experienced dentist is familiar with the fact, that an artificial substitute resting upon diseased roots of teeth, and impinging continually upon gums already irritable and inflamed, soon becomes a source not only of annoyance and discomfort to the patient, but is rendered, in a great degree, inefficient in the performance of some of its more important offices. There is, besides, a perpetual and cumulative aggravation of the morbid conditions, and sooner or later irretrievable destruction of the remaining natural organs will be induced.

It may be stated as a general rule of practice, that all the remaining natural teeth that are

* “Practical Treatise on Mechanical Dentistry.”
By Joseph Richardson, D.D.S., M.D., Professor of
Mechanical Dentistry in the Ohio College of Dental
Surgery, &c. p. 111.

not susceptible of being restored to a state of comparative health and usefulness, should be removed before inserting an artificial substitute. Especially should this course be pursued whenever the remaining roots are found partially or wholly necrosed, and the peridental membranes and surrounding tissues inflamed and suppurating. Such should be extracted if for no other reason than that they are offensive in the mouth, and tend, in a greater or less degree, to compromise the general health. In respect to the utility, comfort, and permanence of a dental appliance, the expediency of removing the roots of teeth prior to the introduction of the former, is apparent. If a dental substitute is adapted with necessary accuracy to all the parts which it covers, it will be plainly seen that the forces applied to the base at every occlusion of the jaws in the act of mastication, instead of being equalised or diffused, will be expended mainly on the fangs, inasmuch as they afford so many

fixed points of resistance, whilst the adjacent soft tissues, yielding to the pressure, permit the artificial piece to bear with undue and unequal force upon the roots. The consequences of this action are inevitably pernicious. In a comparatively short time, inflammation and suppuration are induced about the fangs, which ultimately become loosened and painfully sensitive to the slightest pressure; the secretions of the mouth, becoming more and more acrimonious, act persistently and with increasing energy upon the remaining natural teeth, induce rapid and general decay; contiguous parts, through their immediate connection or sympathetic relations with the structures of the mouth, respond to the local disturbances, and the case, in time, becomes complicated with those various distressing maladies about the head and face so commonly associated with diseased conditions of the buccal cavity. At last, the patient, no longer able to endure the

offensiveness and distress arising from the presence of the substitute in the mouth, or to properly masticate his food, is compelled to have the offending organs removed."

This statement is clear and explicit: and it leaves no room to doubt the course to be pursued when artificial teeth are about to be inserted.

It is difficult to conceive that even the most ignorant person can be long engaged in inserting artificial teeth over the natural roots without obtaining some idea of the deleterious effects of such a practice; and that it would not ere this have met with more opposition and protest on the part of dentists, were there not some supposed self-interest in the matter. Patients are more easily persuaded to have artificial teeth if they can be made to believe that such substitutes can be inserted without pain; and they are led to think that the dentist who promises to insert them without pain is both kindlier and more clever than he who advises the proper preparation of the mouth, although the intelligence, the integrity, and the charity are entirely with the latter. Moreover, in thus misleading the patient, the case is at once secured; whereas if the mouth is properly treated, there must be a temporary, and afterwards (when the absorption of the sockets has ceased) also a permanent

case constructed: otherwise there ensues a delay which involves some uncertainty. The motive, however, which induces dentists so readily to acquiesce in and even advise this inexcusable quackery, must be left to the conscience: we can only deal with the facts which such a practice presents. These facts have been clearly stated. And the patient, so far from listening to any intimation that such a course of procedure could be otherwise than against his interest, must regard any success that appears to attend it as a very rare exception, and only a postponement of the inevitable evil. Indeed it is not too much to say that he may regard any person, whatever may be his position or reputation with the public, who advises, under any circumstances, the retention of dead roots (unless in some rare instance, and then only when he proposes to treat and fill them as hereafter described) when about to insert artificial teeth, as one whose ignorance or cupidity, or both, are too great to allow any confidence to be placed in him. For so far from proffering any such advice, the dentist who has any regard for his patients (especially if they are of the humbler class, and expense is a consideration) and who has any respect for his profession,—or even the self-respect which no man should be without,—will give advice to the very contrary effect: and point out the consequences that, sooner or later, must inevitably follow. Moreover, as artificial teeth in a mouth that has not been properly prepared for their reception must, in almost all cases, do more harm than good, a conscientious dentist will not be content to insert what he

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knows his patient had better be without: although a rigid adherence to his duty in this matter will certainly result in his seeing much of this sort of practice (otherwise coming to himself) pass into the hands of his less intelligent, or it may be less scrupulous neighbours.

When the tartar and the other irritants of the gums have been completely removed, and the gums are thereby restored to health, much of the decay that may have commenced will be revealed. And the restoration of the gums to health will allow of the teeth being operated upon with a far greater degree of comfort to the patient, and of success on the part of the dentist, than was possible before this restoration is effected.

If decay has commenced, the aid of a dentist is indispensable; and the disease should be entirely removed. In the first stages of decay it will be confined to the enamel, and is so superficial that this will be all that is required, except to thoroughly polish the surface of the tooth; after which, care upon the part of the

patient in keeping it clean, will generally prevent further progress of the disease. But if in removing the decayed portion of the tooth a cavity is either found or formed, both it and the tooth should be so shaped as to receive a proper filling, which may then be introduced. And if this operation be performed in a skilful manner, so as to meet all the requirements of the case, decay will be arrested. Cases may occur which will defy the skill of the best dentist, but they will be very few indeed ; and in the hands of an accomplished operator, this process will prevent the irritation and death of the pulp,—provided it be not already exposed by decay,—and the train of destructive and painful consequences which are otherwise almost inevitable.

Easily as this may be stated in general terms, and easily as it is by many thought to be accomplished, it involves an amount of ability such as, at present, is seldom met with in the

dentist. But when he does unite the requisite learning and surgical skill, the result aimed at is secured in a manner which still remains, even to those most familiar with it, a marvel of human success.

It is proper to observe that it is not ordinary "tooth stopping" as practised by the great majority of dentists, that is here indicated; for this has little effect for good, and is often productive of much harm; the usual result in the end being that, after all the pain and the trouble, instead of finding the natural teeth preserved, the patient is at last brought to the necessity of artificial substitutes.

Dentistry, when rightly practiced, has passed far beyond the daily exhibition of charlatanerie seen not only in the mass of its practitioners, but almost as frequently in many, who, through influences foreign to merit, have secured a name and a position with the public. And patients have a right to demand, if not the highest degree of skill, at least some approach to it on the part of those who assume to be learned and skilful in an art, compared with which, there is not one that demands a greater amount of either of these qualities.

Although when disease has got control of the mouth the aid of the dentist is indispensable

to its restoration to health, not only before this condition has been reached, but at all times after the disease has been arrested or removed by the dentist, the health of the teeth and gums rests much more in the hands of the patient than is generally supposed.

If decay or the accumulation of tartar is to be prevented, either before disease has commenced, or after it has been reduced, it is indispensable that the strictest attention should be paid at all times to the cleanliness of the teeth.

The food which accumulates between them should be carefully removed after every meal by means of a soft tooth-pick made either of quill or wood, or by means of floss-silk thread, or any other substance that is not hard and which will reach all the points where the food is lodged.

The absurd idea is held by many that to use a tooth-pick is improper. Proper it certainly is not, any more

than it would be to use a tooth-brush, at the table, or in any public place. But altogether to eschew the use of the *most valuable agent in preserving the teeth from decay*, simply because vulgar people use it at inappropriate times, is to emulate their folly.

When all the accumulated foreign substances have been removed, as far as possible, with the tooth-pick, the teeth should be so thoroughly brushed with a soft tooth-brush and water of a pleasant temperature, that the newly deposited and still soft tartar shall be entirely removed,—especially at the edges of the gums,—and that nothing whatever of an extraneous nature shall be left in contact with them.

It is a great mistake to use a hard brush ; for if the gums be tender, either the brush will not be allowed to touch them—as is usually the case—and hence the teeth will not be cleansed at the edges of the gums (the very places where cleansing is most important), or else the gums will be unnecessarily lacerated and inflamed. Besides, quite contrary to the popular belief, a soft brush in any case cleans better than a hard one. In using the brush, it should be applied to the lingual as well as to the labial surfaces of the teeth ; and it should also be carried over them lengthwise as well as crosswise.

Generally speaking, a tooth-powder is a desirable, and in many cases it is an indispensable, addition. But the powder must be a compound prepared solely with a view to assist the brush in its mechanical action ; for when such a preparation acts medicinally upon the gums and mucous membranes,—as do all those tooth-powders and washes into which myrrh, Peruvian bark, quinine, chalk, camphor, and so forth, more or less enter,—it promotes an irritation of these structures which leads to increased viscosity of the oral fluids, whereby decay is indirectly induced ; and when it acts chemically upon the teeth,—as do all those powders which contain acids to *whiten* the teeth,—it directly destroys them.

It is amazing to find what nauseating, and not only useless but greatly injurious compounds are sold by apothecaries, and even recommended by medical practitioners, as tooth-washes and tooth-powders. A tooth-wash may at once be disposed of by saying that under no circumstances can it be of service ; since it can neither

clean the teeth, nor remove the tartar without injuring them. Nor, as the inflammation of the gums is caused by a local irritant, can any *astringent* introduced into the mouth be other than either useless or harmful; for, so far as it has any effect it will induce the irritation it was introduced to allay. Many objectionable medicines are used in tooth-powders and washes; and the most pernicious are perhaps the most common—namely, myrrh and camphor. The irritation of the mucous membrane which these drugs cause, when in any strength, is always considerable and sometimes very great.

So strongly are some tooth-preparations medicated that medicines in potent doses are often interfered with, and the physician is perplexed by witnessing a result he did not expect.

Without entering upon that interesting field of investigation,—namely, the particular effects upon medicines which come of the diseased condition of the mouth,—it is well to invite attention to it. And it is proper also to make some suggestions to the disciples of Hahnemann. Admitting all that its advocates claim for the infinitesimal dose when administered upon the tongue in a healthy mouth, it must be apparent to every intelligent mind, on reflection, that the action of such a quantity of medicine must depend, not only on the complete purity of the oral secretions but on the entire absence of all, even the slightest, opposing medicinal action. We are told by those who follow Hahnemann that no drug must come in contact with their medicines; even flowers being forbidden the sick room on account of

their perfume. Camphor is expressly forbidden as being an antidote to almost all homœopathic remedies. It is easy enough to perceive that all this is in strict accordance with the infinitesimal dose theory. But let it be answered by those who contend that when two drugs are given together, no one knows what the patient has received,—what has one of these infinitesimal doses become after mixing with the oral fluids when they contain acids powerful enough to destroy the dentine: or when it floats in these fluids after they have become impregnated with the mercury constantly given off—granted, in the most infinitesimal of quantities—from a large number of amalgam fillings inserted in the usual manner of dental operations? Let it be answered likewise,—how many million times a millionth part of a grain of medicine will be antidoted by the daily use of a camphorated tooth-powder!

The truth is, that before even the primary question raised by the infinitesimal dose theory can be satisfactorily answered, dentistry, as practised by the majority of those who attempt it, must become far more elevated than at present is the case—save with the rarest exceptions—even among the few who have managed to secure the better kind of reputation. In short, before the homœopathic practitioner can reasonably feel any degree of confidence that his medicines will have, in general practice, the effects which he attributes to them, the time must come when for a dentist to put all the structures of the mouth into a healthy condition, and then to instruct his patient how to keep it so, shall be the rule of prac-

tice ; instead of being, as now, apparently an unheard of proposition among dentists. The American writers on homeopathy have the advantage over their European friends, in constantly coming in contact with a more advanced condition of dental science ; and have evidently had these suggestions forced upon them, since their later writings contain allusions to the necessity of the purity of the mouth. But even the American writers indicate little knowledge of the absolute necessity for this. They also emulate their European compeers in adopting the most extravagant theories on facial pains.

While the agency of sugar, condiments, and so forth, in destroying the teeth is by most people immensely over-estimated, under no circumstances should saccharine substances be long held in the mouth. Nor should any of the dentifrices formed into a paste by means of honey or any similar substance ever be used.

It is necessary also that when acid or other medicines injurious to the teeth are taken, they should not only be administered through a tube and with the greatest care so as not to touch the teeth, but that the mouth should immediately be rinsed with water that is slightly

alkaline, and the teeth thoroughly cleaned with the brush.

Furthermore, none of the quack nostrums recommended for tooth-ache should ever be resorted to; since these almost invariably contain some powerful acids which can never be beneficially used by the sufferer, or by anyone else except in the manner to be described.

At nearly all chemists' shops, especially those of an inferior character, remedies for tooth-ache are sold. These nostrums are often sulphuric acid, and sometimes one of the others hereafter named. These acids are usually deposited in large quantities in the cavity of the tooth, without any attempt being made to remove the *debris* or to protect such teeth as are sound. By this means not only is the pain not arrested but it is often increased; since the aching pulp is not reached, and the pressure of the agent by which the preparation is introduced forces the decayed dentine and other accumulations existing in the cavity upon the pulp, whence increased inflammation of this structure is nearly certain to ensue. The acid, also, not being confined, burns the cheeks and gums wherever it comes in contact with them; and becoming almost immediately mingled with the saliva, is carried thereby to the other parts of the mouth, destroying the teeth in the most direct and rapid manner.

There cannot be a doubt that the frightful loss of teeth noticeable among the poor is very largely attributable to the indiscreet use of these pernicious preparations. Almost all of the lower class—especially the advertising—dentists have also for sale some tooth-ache compound. Both these and the chemists, it is charitable to suppose, are not aware how much injury they inflict upon the poor.

The treatment of devitalised teeth is, strictly speaking, for the purpose of preventing tooth-ache ; but it will be found much more convenient to explain it when treating of Cure.

THE CURE OF TOOTH-ACHE.

SOVEREIGN remedies for this pain are not only dispensed as above intimated, but are also named with great confidence in almost every domestic circle. But the simple fact that there is not the slightest approach to agreement in them, is sufficient evidence that they are not selected upon any sound principle; and an enumeration of the domestic remedies would be found more fitting for insertion in an illustrated comic periodical than in a sober treatise like the present.

The cure of tooth-ache, or the success which may attend efforts in this direction, depends very much upon its character. Odontitis is easily

managed; but periodontitis is frequently beyond remedy, and is to be removed only with the tooth itself.

When the pulp has become exposed and the tooth aches, it sometimes happens that it had better be at once extracted. But if undesirable to remove the tooth, this pain may be relieved by the application of a local anodyne. Oil of cloves, carbolic acid, and many similar preparations will act as anodynes to the pain in question; but the application of creasote will be found the most efficacious, and it will almost instantly relieve the pain of odontitis.

Whenever a tooth-ache remedy is introduced into the cavity of a tooth,—being necessarily a powerful acid,—it must be so well protected that it will remain where placed; and thereby not only fulfil the intended use, but produce no injurious effect upon the other teeth. Wax, gutta-percha, and similar substances are used for this purpose; but the liability of these to

create pressure upon the already inflamed pulp is too great, and they do not sufficiently confine the remedy to its place.

The proper substance to use is finely-ground plaster of Paris mixed with sufficient water to form a soft paste. The simple and harmless application of creasote is accomplished by carefully removing,—so as if possible not to touch the pulp and thereby increase the pain,—all the *débris*, such as food and decayed dentine, which has accumulated in the cavity of the tooth. When this has been accomplished and the pulp is laid bare, so that the medicament may come in direct contact with it, the cavity may be dried out with paper or cotton; and after arrangements have been made to keep it dry for a sufficient length of time, a small pledget of cotton containing from a tenth to half a drop of creasote may be introduced directly upon the pulp. The remainder of the cavity may then be filled with the soft plaster, which

must be protected from the saliva until it has "set." An immediate, and afterwards, an occasional rinsing of the mouth with water will prevent any deleterious effects.

The plaster will not remain where deposited more than a few days ; and as the creasote is only a palliative, the application of this anodyne by itself is advisable only when the pain is severe, and the immediate destruction of the vitality of the tooth by artificial means would be likely to prolong, and perhaps to increase the pain.

As the irritation of the pulp, when once it is excited, is certain in the course of time to cause its devitalisation, it is best at once to accomplish an end which cannot be prevented : so that the suffering which is almost certain to follow the exposure of this structure, may be thereby curtailed. It is incumbent on the operator that this result should be accomplished with as little pain as possible.

The destruction of the vitality of the tooth is what dentists call "destroying the nerve;" a term which, although indefinite, is not altogether inappropriate.

The pulp is medicinally devitalised by the application to the tooth of a minute quantity of arsenic,—say from one-fiftieth to one-thirtieth of a grain. The application of the arsenic must be a little different, however, from that of the creasote.

While the medicinal devitalisation of the pulp should always be brought about in a harmless manner, and should seldom excite pain, great and unnecessary agony and much injury are often the result of this process.

The chief mistake made in applying arsenic to a tooth, is the excessive use of it,—so much as three or four grains being sometimes placed in the cavity,—which causes very great irritation, not only in the pulp, but in the periosteum. Other mistakes are not first removing the decayed dentine so that the arsenic may be applied upon a sound spot; also in applying it directly upon the exposed pulp; and more especially, in crowding the material used for a covering so hard upon the pulp or

the dentine lying above it as to cause excessive inflammation and excruciating pain in this structure.

As the mineral is used to destroy the tissues of the pulp, if applied in too great quantities or directly to this structure, it will create extensive engorgement of its vessels, and consequently for a time severe pain. It is a common practice with the more intelligent dentists to unite with the arsenic about the same quantity of morphine ; and this, to some extent, certainly counteracts the painful effects of the mineral. Others go further and make a paste of morphia, creasote, and arsenic ; or what amounts to the same thing, they take up on a pledget of cotton previously saturated with creasote, a mixture of the two dry substances.

A small quantity of *aconitine* added to the arsenic will also have a powerfully anodyne influence upon the pulp : but this preparation is not to be used by any one unacquainted with

its potency, as the fiftieth part of a grain has been known to endanger life.

If the tooth be aching, it is best to first subdue the pain with creasote alone. In order to accomplish this, the creasote may have to remain in the cavity covered with plaster of Paris for twenty-four hours; but the pain can usually be so thoroughly reduced in a few moments,—by removing the *débris*, drying out the cavity, applying the remedy and protecting it with dry cotton and a mouth-napkin held by the finger of the operator over the cavity,—that the application of the arsenic may be immediately made. If it has been necessary to use the plaster, at the end of the time named it should be carefully removed so as not to disturb the pulp.

When the tooth no longer aches, a pledget of cotton containing creasote alone should be placed directly over the pulp; and another, containing a mixture of arsenic and morphia, may then be placed against the sound dentine

at a point which has been laid bare for that purpose, and the whole, as directed, be covered with plaster of Paris. The creasote, acting directly upon the exposed pulp, will prevent a recurrence of the pain; while the arsenic will gradually penetrate the dentine, destroy its vitality, and eventually the vitality of the pulp also.

If the pulp be certainly exposed and yet there is no pain, it is best to remove a portion of the decayed dentine so as to expose a sound spot at a point remote from the pulp, taking great care not to irritate this structure. The arsenical preparation may then be applied, and covered with plaster.

The arsenic should not be allowed to remain in any tooth more than twenty-four hours; and in some teeth retention for only a few hours is prudent, as this mineral, if too long retained, causes the permeating fluids of the dentinal tubes to assume a pinkish colour, and that hue becomes imparted to the tooth.

The pulp will generally be found so much disorganised in from four to five hours after the introduction of the arsenic, that it will not again ache continuously. But there will be so much vitality remaining in the root for some days, and in some instances even for weeks, that it is usually best to remove the decayed dentine and a portion only of the pulp, and then to fill the cavity temporarily; waiting, before anything further is attempted, until the root can be operated upon without pain.

There is another mode of destroying the pulp much in vogue; namely, suddenly thrusting into it some sharp instrument. This is usually done without any warning to the patient of what may be expected; and even some practitioners are found so lax in their ethics that it is preceded with a solemn assurance—intended to deceive, lest the patient should exhibit the decided unwillingness, natural, when asked to undergo such torture—that no pain need be

feared. The effectual puncture of the pulp will certainly accomplish the intended result ; but the agony is so frightful and the shock to the nervous system is so severe that the patient will be found, after having once been deceived and tortured in this manner, never again willing, and in many cases utterly unable ever again to submit to dental operations.

Cruel and unnecessary as is this mode of destroying the vitality of the tooth, there are dentists who—seemingly ignorant that owing to the delicate structure of the pulp, a single thrust of a needle is certain to destroy it—add to this unspeakable horror by an arrangement whereby, while the needle is held in the pulp an electric spark is communicated to it and the pulp is exterminated by cauterisation !

Considering the utterly painless manner by which this structure is usually devitalised, these practices have not the slightest excuse.

As in more or less time, unless the tooth be

treated and filled into the roots, periodontitis is certain to follow the death of the pulp, to fill at once permanently and only into the crown,—as, it may be said, is universally done,—is to make no provision against this pain; which may commence in all its severity within a few weeks after the tooth is dead. In view of this fact, in almost every case it would be far better to remove the tooth at once, rather than to follow the empirical course so very generally adopted.

The pulp being the centre of vitality in a tooth, the death of this part, instead of preventing future tooth-ache,—as is too often imagined will be the case,—is, as has been shown, only the beginning of the end; and it is but another step in nature's progress towards the expulsion of the tooth from the mouth.

As periodontitis is certain to follow the devitalisation of the tooth, it becomes a serious question what is to be done with it under these

circumstances. When a tooth was reduced to this condition, it is but within comparatively recent times that all that could be accomplished was either to extract it at once, or else,—if it was thought it might be retained for a short time,—to fill it; at the same time perforating the tooth from the side into the pulp cavity,—as recommended by Dr. Flagg, of Boston, Mass.,—thus forming a passage by which the pus could be discharged. The condition of the tooth was then explained to the patient; and he was given to understand not only what might always be expected, but what was certain to follow in time; and this was supplemented with advice to have the tooth removed as soon as the pain became unbearable.

Fortunately, however, dental science has advanced to such an extent, that not only in almost every instance where the pulp has been only recently destroyed is it possible to prevent this painful affection,—but in a large majority of

cases the alveolar abscess can even be healed, and its recurrence prevented.

In describing the organisation of the teeth, it was shown that it is only the enamel and the dentine which entirely depend upon the pulp for vitality; and that to a considerable extent the vitality of the cementum is derived through the periosteum. Hence it follows that, while the inflammation of the pulp necessarily involves its own devitalisation and likewise the devitalisation of the enamel and the dentine, the death of the cementum is not necessarily included. The last-named structure in fact, is able to exist in a comparatively healthy condition so long as the mere devitalisation of the other structures of the tooth is all that follows the death of the pulp. But as this condition of the cementum cannot long continue, and inflammation in this structure is sure to be set up in the course of time if it is left to be acted upon by exciting agents, the problem is presented to

the dentist how to prevent it, and thereby retain the tooth in the mouth without disease or pain.

This desirable end is accomplished by first removing the entire pulp, when it has become devitalised throughout its whole extent, with delicate instruments expressly shaped and tempered for the purpose; and then filling the pulp-cavity either with gold or tin-foil, thereby preventing the action of any irritating agent upon such living organisation of the tooth as remains. To arrest further decay, the tooth should afterwards be filled in the crown in the ordinary manner.

When the principles of this elegant operation are correctly conceived, and it is performed with the skill which it indispensably demands, success is almost certain.

The mode of filling a dead tooth into the roots has frequently been described. Yet we find very few dentists undertaking it, even rarely, and still fewer who

are successful in the performance. The reason of this is not difficult to discern. The very nature of the operation demands an intimate acquaintance with the anatomy of the tooth, and all the conditions of its several structures alike in health and disease. Without this there can be only guess work ; and failure from one cause or another is almost inevitable. It is true that in rare instances the operation is successfully accomplished by dentists of the average standard. But when this happens, the success is attributable rather to good fortune than to skill ; and failure among this class of dentists whenever the operation is undertaken, is so general that it has engendered with them, if not absolute disbelief in its efficacy, at all events very **grave doubts.**

Not comprehending the principle of the process which they address themselves to, they do not know when they possess or are unprovided with the suitable instruments. They cannot determine when they have penetrated to a sufficient depth in the root ; they are very apt to force the instrument through the side of the root, thereby irritating the periosteum and inducing inflammation in the structure that should be protected ; and various other mishaps combine to render the attempt abortive.

When the tooth has been so long devitalised that periodontitis has become developed, it should be at once extracted, unless it be one

particularly desirable to retain, and which can be restored to a healthy condition.

Since the inflammation which causes the pain of periodontitis is not, except to a very slight degree, in any of the structures of the teeth as in odontitis,—but is rather an inflammation in other structures resulting from the death of the tooth,—while the removal of the irritating agent will eventually relieve the pain, the suffering will not always cease on the instant. Indeed, for a time, it will in some instances be much increased. When, therefore, it is discovered that the extraction of the tooth for periodontitis does not afford instant relief (as it will in cases of odontitis), it is not to be assumed that there has been a mistake in the diagnosis and that the pain was not tooth-ache, but “*tic*,” or “neuralgia.”

If the tooth be one that should not be parted with, about the only relief for this malady is nature's own process, above described; for, owing

to its locality and character, little can be effected by the dentist, except sometimes in mitigation of the pain or to promote the discharge of the pus in the right direction.

It is always very much easier to offer sound advice than to combat errors in opinion and practice ; and it is exceedingly difficult to get proper advice adopted when it happens to be of a negative character. Many patients seem to think that when there is disease nature does nothing, or next to nothing, towards the cure ; and that this is wholly effected by medical treatment ; and when they consult a medical practitioner, they appear to take it for granted that he will at least do *something*. It is also curious to observe that almost anything will pacify such patients, if it possess the one quality of *action*, even though it may be quackery the most ridiculous. Hence, if the medical man suggests that nothing should be done, and recommends that the disease should be left for nature to work out her beneficent ends, not only is the proposition incomprehensible, but the adviser ceases to be regarded as a competent physician : and the patient too often feels,—whether he expresses it or not,—that it was not for this that the medical man was sought. So determined will a certain class of persons often be found that something shall be administered, that when the doctor has advised them to trust to nature,—although necessarily quite ignorant of the disease and of the effects of remedial agents,—

they will nevertheless not infrequently themselves apply some supposed remedy which has been suggested by one as ignorant perhaps as themselves, and which not only aggravates the disease, but removes it beyond the control of any properly applied agent.

This class of patients is so numerous that the practitioner whose only aim is success in getting a practice, at once falls into *their* view of his duties; and even the most conscientious, from the pertinacity of the patient, is apt to be sometimes unconsciously misled.

It is almost entirely in consequence of this idea,—though it may not be expressed in words,—namely, that a remedy of some sort must necessarily be applied, whatever may be the affection or its character, that it is found so difficult to indicate the proper course to be pursued when an alveolar abscess is threatened.

It would seem an axiom in therapeutics too plain to be mistaken, that the use of a remedy is to assist and in no way to interfere with nature; and that an intended remedy should never be applied until there is a pretty clear perception of what it is that obstructs nature's processes, and that the action of the agent selected should be so well understood that it will be known to produce the specific end in view.

Yet the intelligent dentist finds that his greatest difficulty in dealing with periodontitis is to prevent the adoption of advice tendered by persons who can have no idea whatever of the nature of the disease beyond the fact that there is pain in the face; and to prevent also, the application of agents which, so far as they

have any influence, can only produce effects the very opposite to what are desired.

The first remark to be made, accordingly, with reference to the cure of this disease, is that the patient should *do nothing* except in accordance with the very best professional advice, since the supposed remedies which are usually applied will be almost certain to prove more hurtful than beneficial ; and further, that in seeking advice, in this and in all other cases, instead of doing so with a preconceived notion that active medicinal effort should at once be commenced, the patient should remember that the primary, and often the most important consideration in the physician's mind is the question thus foreclosed ; and that it is one which the medical man alone must decide.

The second remark is that the practitioner would accomplish results more useful by *doing nothing*, and leaving the progress of the disease to nature, than by applying anything which had not a direct reference to some specific end ; a clearer comprehension of which had been obtained through some better channel of information, on this and kindred subjects, than ordinary text-books.

The efficacy of an antiphlogistic treatment based upon general depletion, which has been suggested, is more than questionable. It can do no good, and may be productive of much harm,

as we find this pain generally arises when the system is in an exhausted condition. Local bleeding, so much relied upon, while open to no very serious objection, is seldom found of use ; and the good effects of sialagogues, which have also been named, are very doubtful.

What, however, is especially to be avoided when pain is felt in the teeth or in the face, is the *application to the cheek of emollients*, such as linseed, bread and milk, hot mustard, and so forth. For these, so far as they act upon the disease, directly increase the danger of the discharge being made through the face or into the antrum instead of into the mouth. They also promote the spread of the inflammation, which should be confined as much as possible rather than be allowed to extend.

The pus from an alveolar abscess is not infrequently discharged upon the face. The author once met a young lady who had no less than three scars upon her face, which her physician informed him had been pro-

duced by the application of emollients when suffering from face-ache caused by alveolar abscess. By the advice of her physician, another young lady applied to the author some few years since with a running sore at the base of the lower jaw, which, after vain attempts to cure it, extending over three years time, a country practitioner had pronounced to be *scrofula*! The removal of an inferior molar tooth, which was the cause of an abscess, not only cured the disease, but took from this lady the weight of a supposition which had greatly depressed her spirits and thereby seriously affected her health.

Nothing of a local character can be much relied upon. But a roasted fig or raisin, or anything that will act as an emollient, applied to the gums over the affected root, will generally hasten suppuration; and also help to cause the pus to be discharged in the right place.

The application to the face of cold water,—and sometimes warm water,—frequently renewed, or of a fomentation of poppy heads with either chamomille, calendula, or a small quantity of aconite leaves, will generally assuage the pain.

But if the pain be very severe, and no relief

is obtained by the application of any of these remedies,—then from half a grain to a grain of quinine (repeated if necessary in an hour) will be almost certain to afford at least temporary if not always permanent relief; especially when the pain is periodic, and accompanied by febrile symptoms.

Several experiments very recently made by the author go to show, as has been stated, that this drug is a specific for periodontitis. It has been observed in several instances to assume so direct and immediate a control over it, that the acute pain was relieved in a very short time,—even when it had continued for some weeks,—and to leave the seat of the pain sore to the touch, showing thereby that the inflammation had not subsided: after a time this has also disappeared without a recurrence of the pain.

Before resorting to quinine, however, the other remedies had better be tested, and this one be adopted only as a last resort. Nor should it ever be given simply because there is tooth-ache—but for periodontitis only.

When the abscess has progressed so far that the pus is ready to burst through the gum, the

application of the lancet in the right place will relieve it.

Sometimes, notwithstanding all the efforts for relief, the inflammation is very great, and the pain is so severe that it cannot be endured; and although the tooth be ever so valuable, extraction must be resorted to. When the tooth is thus valuable, if able to retain it until the abscess has subsided, the patient should immediately seek a dentist,—if such a one is to be found,—who will prevent its recurrence.

It is unfortunate that so many dentists,—and even dentists with lucrative practices,—seem as unconscious as the public of any other cause of tooth-ache than an “exposed nerve;” and that they should imagine when a tooth is the unmistakable seat of pain, that such agents as creasote, carbolic acid, arsenic, &c., will give relief. Strange as it may seem, these agents are often applied in great quantities to the tooth in cases of periodontitis,—with what result it is easy for any reader of these pages to determine.

A gentleman applied to the author while suffering from the pain occasioned by a devitalised tooth, which he was recommended to lose. Not feeling able to endure

the pain of extraction, he declined to have it removed. In a day or two afterwards he accompanied a friend on a visit to a dentist ; and the fact that he was suffering from tooth-ache becoming known to this person, he at once proposed the application of carbolic acid. He was promptly told that the patient had been advised that no local application could be of any service, as the tooth was aching because the nerve was dead. This statement seemed so far beyond his comprehension that it was treated with contempt, and he declared that no tooth could ache except from an exposed nerve. The patient,—only too anxious to be relieved from pain,—submitted, accordingly, to the application of this person's cure-all, which it is needless to say afforded no relief. Such cases as this are by no means uncommon ; and in nothing has the author found more difficulty than in combating the idea that where there is a dead tooth there cannot be tooth-ache.

Although it is best that periodontitis should be prevented, even when there is inflammation in the cementum and periosteum resulting in alveolar abscess the tooth is not yet beyond the reach of the highest dental skill. If the tooth can be retained until the pain has ceased, the pus has been discharged, and the swelling and inflam-

mation have subsided, the parts return to their former chronic condition.

While in this state,—after all the decayed dentine, the secretions, pus, and other accumulations in the tooth, which are the irritants whereby inflammation is excited, are removed to the very apex of the roots,—the renewed application of a powerful antiseptic to each root, will, in time, overcome the putrescence ; and a comparatively healthy action will be restored to the periosteum and cementum. This, if continued, is all that is required to retain the tooth with comfort in its position.

As soon as this condition is reached,—but not until it is entirely accomplished,—the roots may be filled ; and after a few days, the crown also, as above directed : and if the treatment and operation have been correct and thorough, the retention of the tooth may with much confidence be relied upon. We may however conclude that its liability to disease must be greater than that

of a tooth in which the pulp remains unaffected ; and that when the system is greatly prostrated, or the patient is suffering from a severe attack of any disease which excites undue cerebral action, it may be expected in a greater or less degree, despite all preventive treatment.

If the operation of filling a dead tooth prior to the inflammation of the periosteum be one requiring the highest dental skill, the treatment of abscess and subsequent root-filling requires no less. And it would be difficult to find in the whole range of surgery, an operation in which the conception is finer, or in which the treatment is based upon principles more scientific.

It is to be observed that this treatment and the subsequent filling of a dead tooth is a painless operation.

When the treatment for the prevention and cure of the different forms of tooth-ache cannot for any reason be adopted, the offending tooth should be removed ; since even if it were of any

use, this could not be sufficient to compensate the injury to the structures of the mouth, the stomach, and other parts, which is caused by a decaying, dead, and ulcer-forming tooth ; and it invariably more or less (and in many cases entirely) prevents the otherwise efficient use of the remaining sound teeth, which if the diseased ones were removed, would be equal to the purposes of mastication.

DISEASE IN THE ANTRUM.

ALLUSION has been made to the Maxillary Sinus, or *Antrum Highmorianum*.

This cavity is situated in the body of the superior maxillary bone, and communicates with the middle meatus of the nose. It is sometimes perforated by a root of one of the posterior teeth. So long as such a tooth retains its vitality, a healthy condition of all the parts subsists. But if one of these teeth becomes devitalised, the inflammation of its periosteum is certain to extend to the lining membrane of the antrum. The wall between the floor of the antrum and the root of a tooth that is

causing an alveolar abscess, may also be so thin that the pus is discharged into this cavity. Other influences cause disorders in the antrum which will sometimes produce alarming and even fatal results. It does not come within the scope of this work to give any details of these diseases. The fact to which we wish to draw attention is that such diseases are by no means infrequent, and that severe pain ensues. Of these cases many, and in all probability a large majority, are relieved and cured by the extraction of the offending tooth without any knowledge on the part of either patient or physician of their existence. But tooth extraction will not always give relief; and the case is then by far too apt, because of the obscurity of the origin of the pain, to be regarded as an instance of facial neuralgia, and is allowed to prevail perhaps for years, without any knowledge of its existence or attempt to relieve it.

A highly respectable lady of this city was afflicted for many years with inflammation in the lining membrane of the antrum. When the true character of her complaint became known, an injection of warm water a few times repeated produced a cure. The author was applied to by a servant girl who had wandered for some years among the medical charities, to obtain relief for a pain in her face and a discharge in her mouth. She also was suffering from inflammation in the lining membrane of the antrum; and an injection, three or four times repeated, of water slightly impregnated with creasote produced a complete cure.

For the best authority on disease of the maxillary sinus the student is referred to Dr. Chapin Harris.

NEURALGIA, TIC-DOULOUREUX, &c.

IN pointing out the origin and the symptoms of tooth-ache, enough must have been shown to suggest—at all events to the thoughtful mind—the seat of those facial pains which we find so generally regarded as idiopathic affections, and to expose the inappropriateness of the terms by which they are known.

As these terms,—except “tic” and “tic-doulooureux,” the origin of which has already been explained, and which we have seen to apply most unmistakably to odontitis,—are really so indefinite, it will be well to point out that they by no means describe or even suggest any particular disease; and that they give no sort of intimation

as to the cause of these pains. When translated into plain English they are found to express only the fact that there is suffering. For instance, "neuralgia" is simply "nerve-pain." Can any pain be felt except by means of the nerves? Is there any other than nerve pain? So with "facial neuralgia" (nerve pain in the face), "prosopalgia" (face-pain), and so forth:

The patient knows well enough when he consults his medical adviser regarding the symptoms which go under these names, that he has *pain*! It is not to be assured of this in language which he does not clearly understand,—even if he comprehends it at all—and which can be no clearer to the practitioner himself, that he seeks his opinion and aid; but that the appropriate remedy may be applied. So the student, if his ethics be up to the proper standard, does not consult his text-books that he may learn how to employ these empty phrases dexterously; but that he may be able, when

called upon, to perform the uses to which he proposes to devote his life in a scientific and effective manner.

So long as the origin of these pains is sought in a wrong direction, it is not surprising that their character should become more and more mysterious ; on the contrary, it increases in accordance with the wanderings of investigation away from the truth.

Neither is it to be wondered at that,—not knowing their origin, and, for the satisfaction of many patients who would not otherwise rest contented, obliged to give these pains “a local habitation and a name,” we find in such general use phrases which are exceedingly convenient,—sounding, as they do, in the ears of those patients as if, instead of representing in diagnosis an “airy nothing,” they were the embodiment of the most extensive erudition,—for concealing the absence of any real information on these diseases, and as allow-

ing scope likewise for the assumption of the profoundest intelligence, by many who, if constrained to express themselves in intelligible language, would at once reveal their complete ignorance of the whole subject.

But however strongly some such terms may be demanded by many patients when suffering from tooth-ache, and however useful these phrases may be to some practitioners on the ground referred to, it would be difficult to account for the ready acquiescence in them and adoption by the patient, did it not sometimes unmistakably seem as if human nature is really so constituted that, in many people, the spirit excoiated by Thackeray is so great that they actually feel more reconciled—and in some cases even feel flattered—if their disease can have attached to it some pompous and far-fetched, and—what appears to them—a genteel and high-sounding name, which implies that they are not even sick as other people are ; and as if they were dissatisfied both

with themselves and with the doctor, when the malady is found to be, after all, only commonplace and undignifying, and such as anybody might suffer from.

There is nothing so difficult to eradicate as what has become fashionable, however absurd it may be ; for the simple reason that it is based, not upon the judgment, but upon vanity or supposed convenience, neither of which are amenable to the laws of common-sense. There will always be a large number of persons, accordingly, who will not listen with any patience to suggestions which may interfere with what they would have appear to be true, and with whom anything like argument and philosophical reasoning is a mere waste of words.

But it is a happy and a proud matter for congratulation that most of those who practice the healing art are influenced by the highest and purest motives ; and that there are, after

all, comparatively few patients who are really willing dupes to ignorance and pretence. So that it is not so difficult as those who are pursuing a mere crotchet would sometimes have us believe, to establish a truth when once it has been discovered.

The indiscriminate application of meaningless terms to pains which cannot be readily accounted for, has led to some of the most curious as well as the most erroneous speculations upon nervous action which it would be possible to find. To rehearse them would be idle, since they end as they begin—in nothing! When a pain arises, it is the duty of the medical man to ascertain its origin by patient investigation; not to build up a fabric of absurdities through attempting to account for it by the exercise of that tendency of the human mind to make discoveries independently of facts; and which has its foundation in indolence and conceit.

Especially has the term “neuralgia,” become

such a very common designation for almost all painful affections of uncertain origin, that other than dental writers find it necessary to inquire into its use and meaning.

Dr. Barclay says,* “The term neuralgia is one which only serves to remind us of the limited range of our knowledge: had we attained to a perfect pathology, it would find no place in a systematic classification of disease, except as a symptom. In itself a mere sensation dependent on a variety of causes, we are yet forced very often to rest satisfied with the knowledge of its existence, without being able to trace it backward to its true source in the causality of disease; and at the same time its very vagueness too often serves as a cloak for ignorance, or furnishes a ground for deception. It is exposed to all the difficulties in investigation which are inseparable from merely subjective phenomena,

* “A Manual of Medical Diagnosis.” By A. W. Barclay, M.D. p. 249.

and there are few indications by which we can correct an opinion we are driven to form merely upon the patient's own statement: even when convinced that there is no exaggeration or deception, we are still so ignorant of the changes in nervous structure, that if we be able to prove by post-mortem evidence that there has been no other cause for the pain, we must still rest satisfied with the fact that it has been felt, and with the expression that it was neuralgia."

Having thus defined this term as a vague expression, this author continues: "One point is perhaps not sufficiently attended to in the employment of the term, that while in truth all pain is perceived by the nerves, and in that sense is seated in the nerve, yet all pain ought not to be called neuralgia.

"The true distinction between the two is that in the one instance the sensation is produced by some irritation acting locally on the terminal filaments of the nerves which are the normal

recipients of it, while in the other it is caused by something affecting the trunk of the nerve,—that bundle of fibres, large or small, lying within the neurilemma, which in a state of health does not receive but transmit the sensation: consequently, neuralgia properly so-called affects all the sensitive branches uniting to form the trunk on which the irritation acts, and pain is felt sometimes distinctly to the terminal filaments, sometimes vaguely in the course of the ramifying fibres.”

While this description of pain is pretty clear, when we consider the difficulty in determining what this something actually *is*—or indeed if there be anything—affecting the trunk of the nerve, we find that we are no nearer than before to any clear definition of neuralgia: and we can after all only regard it as designating a mere sensation, the cause of which it is our duty to look for until found: not appearing as if we knew all about it, and thereby deceiving

ourselves as well as our patients with a few empty sounds.

Proceeding to a further description of local pain, Dr. Barclay says that it "is either direct or sympathetic: when accompanied by a febrile state, it is always referrible to some congestion or inflammation; without fever, it is either dependent on some chronic ailment of the part, or it must be regarded simply as neuralgia. The first inquiry, therefore, is whether there be any alteration in the function, normal condition, or nutrition of the part in which pain is complained of; next, whether any ailment exists elsewhere of which such pain is known to be sympathetic. Should careful inquiry reveal no definite cause for local pain, we must be content with the terms neuralgia and irritation; not that they are in themselves satisfactory, but they serve to distinguish conditions beyond which we cannot at present penetrate."

So far from placing too much restriction upon

the use of the term neuralgia, this writer errs, if he err at all, in allowing it so large a place as he does.

That in the present condition of medical diagnosis there are many pains felt in different parts of the body, as to the origin of which it would not be safe to hazard even a guess,—and, in the rarest instances, even in the mouth and face, which cannot be positively accounted for,—there is abundance evidence. And while we are in this uninformed state, the application of the term neuralgia, if never allowed to extend beyond the limits prescribed by the clever authority above quoted, and used merely to designate a symptom, and intending thereby to express only that it is *pain* of which we at present know no more than that it exists, is certainly permissible. Nevertheless, the enquiry may still be legitimately raised,—If from its liability to be abused, is it desirable to use the word at all? And it is past doubt that any

further extension of its meaning, or to use it without a proper explanation that it is a purely negative expression, must be open to the severest criticism, as being calculated both to confuse and to deceive.

When the true meaning of this term has been defined, and we have established the utmost limits to which its range can be legitimately extended, we see that there is not the slightest justification for its indiscriminate application to the every-day pains of the face.

And when the character of tooth-ache becomes well understood, the mind is prepared to emerge from the sea of mysticism into which it has been plunged, and to look for the cause of this malady in the right direction. When this is done, there will be no difficulty in perceiving that tooth-ache is never dependent upon any of the supposed idiopathic diseases to which it has been attributed; and for this best of all reasons, namely, that instead of being

primary diseases, these affections are merely the symptoms of tooth-ache; and that the cause cannot depend upon the effect.

Indeed, when the symptoms and effects of tooth-ache are well understood, it will be found that, while the precise operation by which this malady becomes sympathetic and gives rise to pains in the face (although many suggestions having an air of great probability may be offered) cannot be altogether explained, enough has been learned to show that no pains have a more clearly defined origin: and that medical science has reached a point when, in reference to them, "the expression that it was neuralgia" not only may, but should be entirely dispensed with: and also that a case of facial pain to which we may, with any degree of propriety, apply the term neuralgia would be the greatest of rarities, and not, as we are led to suppose, the almost daily experience of every practitioner.

In most cases of so-called facial neuralgia, well-directed examination of the teeth will so quickly show to the most superficial observer that in these organs there is sufficient cause for the pain,—even if the patient cannot locate it, and the particular offender is not at once detected,—as to dissipate almost all the illusions that have been prevalent upon this subject, and excite surprise that its origin could ever have been in doubt.

It must be remembered, however, that unless the mind be thoroughly convinced that the origin of the pain is in the teeth, and enquiry is pursued with the greatest confidence, and sometimes even with pertinacity, it will often be completely foiled through the inability—and sometimes through the unwillingness—of the patient to render any assistance. Hence there will seem to be no other conclusion than that, whatever may be the general facts, the particular case under consideration must be an ex-

ception, and one that has no connection with these organs; and that it proves, accordingly, that it is not only justifiable but highly proper sometimes to regard facial pains as an idiopathic affection of the trifacial nerve.

Enquiry will also not infrequently fail from the obscurity of the disease, unless conducted by a most intelligent dentist, who is thoroughly familiar with all the peculiarities and symptoms of tooth-ache; and who is also able to make such a minute investigation as shall disclose the facts.

While the general causes which have led to error in the diagnosis of facial pain are found in the prevalent want of information on the character and symptoms of tooth-ache, the particular causes which have misled those who are disposed to pursue proper enquiry, are numerous. Some of these have been already incidentally named, and we will now mention a few others.

It is difficult for the patient to conceive that

such excruciating pains can originate in any other part than that in which they are felt ; and although it may be known that there are decayed teeth in the mouth, the patient is apt to be so very positive that it is not tooth-ache that the enquiry in that direction is dropped ; and the assumption that it is some other affection is too readily adopted. Or it may be that a tooth has decayed into the pulp without any suspicion being awakened that it is decayed at all ; and then, when the pain comes and is felt in another place it is, naturally enough, not likely to be suspected.

• As sometimes happens, when a tooth decays into the pulp and this structure dies without pain, periodontitis may be set up without any previous intimation that there had been disease in that part. In such a case, the replies of the patient may be given in the most perfect good faith and with the most earnest wish to get at the facts, and yet be entirely wrong.

After a pulp has become devitalised by

irritation or by some artificial means, not infrequently the tooth is “stopped” without the dentist having even so much as removed the disorganised mass: and the patient, who has been led—as is almost universally the case—to suppose that the tooth would “never ache after the nerve was dead,” cuts off all further enquiry on the part of one not thoroughly up to all this charlatanerie, by the statement that it cannot be the tooth which aches, since it has been “stuffed;” while all the time the whole trouble is in the inevitable abscess at the root which is sure to ensue upon this treatment.

A tooth is frequently filled by the unskilful dentist without his discovering that decay has reached the lining membrane; when, if pain does not accompany the inflammation of the pulp, it is certain to ensue upon the death of that structure. In either case, as the tooth appears to superficial observation to be in pro-

per condition, it is not suspected to be the cause of the pain.

It is also an occurrence by no means uncommon, for the sockets of the teeth to be so much absorbed through the irritation caused by tartar and other causes, that the periosteum is destroyed. The vital supply to the pulp through the apex of the root is thereby cut off, the tooth becomes devitalised, and periodontitis ensues: the same result may also be induced by a blow upon the tooth.

When a tooth has in this manner begun to be the cause of pain, so preposterous is the idea that it can arise from a sound tooth to those not informed in these matters, that it is at once discarded; and there seems to such persons no possible way of accounting for the pain, except on the neuralgic theory.

It is sometimes observable in teeth which have more than one root, that the sockets are destroyed to the apex of one of these roots,

and that the pulp at this point becomes quite exposed while it continues to receive a healthy supply of blood and nerves through the other root or roots. In such cases true odontitis has been seen to result: and it is easy to imagine how one who does not perceive that the pulp is exposed at this point,—the tooth being perhaps perfectly sound,—naturally enough comes to the erroneous conclusion that it cannot possibly be tooth-ache.

While endeavouring to arrive at a proper diagnosis of facial pain, it is not to be forgotten how very flattering it is to those who dislike to admit that their teeth are decayed,—either from that foolish vanity which some have in being thought not to possess any decayed teeth, or the fear of an operation,—to refer all these pains to any cause but to that which will reveal the truth. And in many cases of tooth-ache, enquiry will be met with the positive assurance that there is not any disease in the mouth: and

this is not infrequently the case when the difficulty would be rather to determine which were the sound teeth.

With this class of patients,—who are more than willing dupes of deception, and whose opinions are based upon their inclinations and not upon reason,—little or no progress will be made by mere enquiry pushed contrary to their cherished opinions; they will be disposed to treat the assumption that they can be suffering from tooth-ache with so much levity and disdain that their answers will become evasive, unpolite, and incorrect; and unless they are plied with leading questions, and are well cross-examined, and the mouth is also examined, the facts will not appear. And even when the facts have become apparent, and proper advice has been tendered, the physician,—or the dentist, as it may be,—will often have the mortification, (or perhaps, and not infrequently, the satisfaction!) of seeing his

patient seeking some one whose ignorance or accommodating disposition,—or, what is more probable, whose mixture of both,—will re-assure him in his conceit. This, however, is one of the penalties of intelligence and integrity which the honourable practitioner can always well afford to pay.

The difficulty, however, of obtaining information by means of enquiry alone, is not confined to the vain or the timid patient. It is also experienced with the most sensible, and with those who are really anxious to render aid to the utmost of their power.

From the common prevalence of erroneous theories, many of the latter class of patients will be indisposed for a time to render much assistance in any enquiry, from an idea of its utter uselessness ; since it will be so extremely difficult for them to realise the fact that—after all they have heard of “tic,” “neuralgia,” &c.,—the pain was really tooth-ache. But with this class, the

confidence arising from intelligence will soon overcome all obstacles, and the enquiry will become as successful as the patient can render it.

But while a casual investigation or a few leading questions may reveal the unmistakable fact that the seat of the pain is in the teeth, when it is to be located, so that the wrong tooth shall not be extracted and the proper one be treated, the whole subject is often so obscure to even the most intelligent patient that, after all the facts—so far as he is able to supply them—have been presented, his liability to be wholly mistaken as to which tooth is diseased—or which teeth, if there be more than one—is so great, that any information he may afford on that point is scarcely worth the asking.

It is only by examining the teeth,—always carefully, and often most minutely—that these facts can be ascertained. And even then, so obscure will the disease sometimes be found, that it will baffle the most experienced dentist.

Indeed, so long as there is an exposed pulp or even the very least remains of dead teeth in the mouth, no other cause for tooth-ache or any other pain in the mouth or in the face is, for a moment, to be suspected.

And if the pain continues, not until there is neither an exposed pulp in the teeth which still retain vitality or a dead tooth in the mouth, will it be time to so much as think of looking for the origin of facial pain *out of* the mouth. And even then, the first suspicion must be that the pains arise, as they sometimes do, from inflammation in the lining membrane of the antrum or maxillary sinus.

When facial pains exist which are not traceable to disease either in the teeth or in the antrum, it will be found that, instead of attributing them to some slight disturbance in the nerve cords, the physician may begin to look for disorder much deeper seated than this; and he should regard the patient as requiring his greatest

anxiety, since in such symptoms there is certainly indicated derangement in the cerebro-spinal axis itself.

Little fear, however, need be entertained that, almost without exception, the pains will be found, and can be properly treated and easily cured, when they are looked for in the mouth.

After a careful study of the symptoms of tooth-ache, it cannot fail to be a matter of much surprise that so many of the commonest symptoms of this malady could be so often exhibited to the general as well as to the dental practitioner, and should also with such frequency be so clearly enumerated in medical writings, without—notwithstanding some of the fanciful symptoms which are often given in connection with the genuine ones—their character being discovered. And when we find these pains so frequently referred to almost any other cause than the true one, surprise at once deepens into wonder: and the reflections

of the thoughtful mind lose hold of that subject, to lapse into contemplation of the absolute bewilderment which pertains to mental efforts having no foundation in facts, or which are leavened by a false theory.

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